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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXIX
No. 10

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NEW YORK, SEPTEMBER 5, 1918

Ten cents a copy
Three dollars a year

Why Hudson Dealers Have Faith in the Hudson Future

Talk with a Hudson dealer and you talk with a man who ha. every confidence in the future.

He is satisfied that the Hudson foundation he is building on is a solid one.

He is not only sure of the quality of the car he sells but he is sure of the manufacturing and sales policies behind it.

He realizes more than ever the long-range vision with which Hudson plans.

He knows that no temporary, abnormal condition is going to obscure Hudson foresight and cause hasty, ill-advised decisions.

He knows that in spite of curtailment the Hudson name will be kept shining as brightly as ever — not only by consistent advertising, but by performance in the hands of thousands of users.

Thus, when the war has passed, the crisis will have proved the Super-Six even more thoroughly perhaps than the speedway —hill climbs—and cross-country tours.

Hudson dealers will have a foundation more solid than granite upon which to build their post-war business.

HUDSON SUPER SIX

Hudson Motor Car Co., Detroit, Michigan

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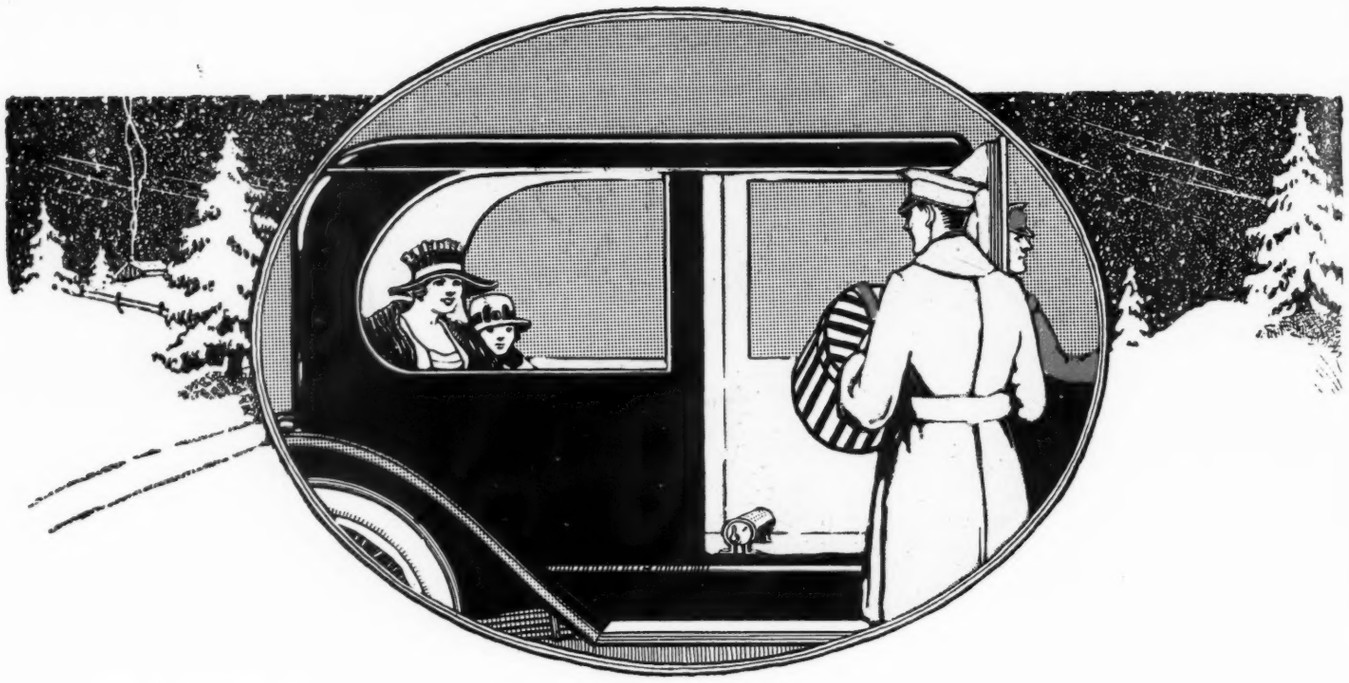


UTILITY
Protected Foot Rail HEATER

NOW IS THE TIME TO PREPARE FOR WINTER

Cold weather will soon be here with a greatly increased demand for Utility Protected Heaters in limousines and enclosed cars.

The Utility Heater is the accepted standard of motor car heating. Its principle is sound, logical and convincing. It insures perfect driving comfort, even in the coldest weather, by tempering the atmosphere of the car to any desired degree. It keeps you warm all over, as though you were in a carefully heated house.

UTILITY Protected Heater—installed in place of the foot rail—is the heater universally recommended by thousands of motorists during the past season—the heater jobbers catalog and the heater manufacturers install as standard equipment.

Ease of installation, attractive appearance, freedom from dust, odor or trouble make it the highly desirable heater. We shall be glad to quote on manufacturers' requirements for standard equipment.

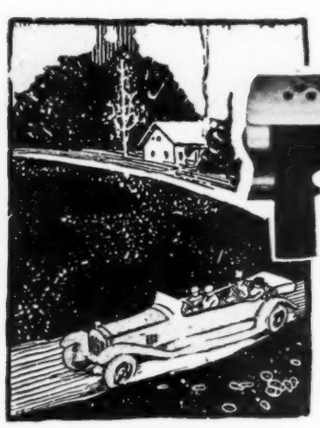
DEALERS—178 more jobbers than last season are now handling the Utility Protected Heater. There must be a mighty good reason.

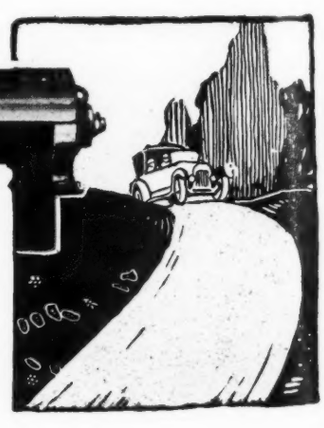
THE HILL PUMP VALVE CO.

Archer Avenue and Canal Street **Chicago, U. S. A.**

Sales Dept: The Zinke Company, 1323 S. Michigan Avenue, Chicago

Manufacturers of Famous UTILITY Auto Specialties





PRICES

Utility Protected Heater	$20.00
Utility Front Seat Heater	12.50
Utility Jr. Heater for Fords	9.00
Utility DeLuxe Heater for six and eight cylinder cars	25.00

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXIX NEW YORK, THURSDAY, SEPTEMBER 5, 1918—CHICAGO NO. 10

Delay in Bombing Planes for War Program

Day and Night Bombers as Essential as Chasse and Reconnoitering Types

Maker Asserts Small Profits Are Made on Liberty Engines

STORY OF FAILURE OF BRISTOL FIGHTER

NEW YORK, Sept. 5—The Senate subcommittee report on aircraft has served to emphasize the fact that we are little more than starting on our program of building bombing airplanes, which in the judgment of not a few European aircraft students must constitute perhaps a dominating factor in our aircraft activities.

We have made progress in building a type of reconnoitering plane in the De Haviland 4 that is useful in such work, as well as in directing artillery fire and photography, but which as a bombing plane is useless, because of its inability to carry a load of bombs capable of doing any material damage. It is only the bombing planes with bomb-carrying capacity of upwards of 2 tons that can work the havoc that must be accomplished if we are to destroy the factories of the enemy, destroy his submarine bases and break up his lines of communication. We could not accomplish this with fleets of chasse or reconnoitering planes even if we had them in the tens of thousands. We must have the giant night bombers with a long radius of action and also the lighter day bombers with their higher speeds and ability to fly at greater heights.

What we need and must have is a synchronized program on the four leading classifications of airplanes, namely, chasse or fighting planes; reconnoitering planes, day bombers or night bombers.

The production for all four types should come along together in their correct numerical quantities. Our aerial program is lacking in its completeness unless each of these four divisions is given its due consideration at the proper time. It is poor policy to needlessly stock up with chasse machines and then not be able to take advantage of the gain so accomplished by failure to do the necessary day or night bombing that should follow.

To illustrate: If we put our entire airplane production at 100 per cent and divide it into the four divisions, chasse, reconnoitering, day bombers and night bombers, we might give figures such as: Chasses, 20 per cent; reconnoitering, 15 per cent; day bombers, 25 per cent, and night bombers 40 per cent.

These figures are only intended to indicate how the entire scheme of activity should be divided off according to the necessities of the war. All four must be carried on simultaneously. We cannot spend a year on one class and then take up another. All four are needed now and we should be as nearly equally advanced on one as on any of the others. It is unfortunate that we are not.

The biggest men in the automobile industry who risked in a great many instances great sums of money in order to help make the aircraft program a success are not backward in condemning the Senate report.

At the present time the automobile industry has over $35,000,000 invested entirely in the manufacture of Liberty engines. The profits on the total number of engines already made cannot as yet be accurately estimated, as insufficient time has elapsed to make complete cost calculations. As an example, however, Packard, which was the first to get into production, made less than 5 per cent on its first order, which was for 600 of these engines. Up to Sept. 1 Packard had shipped 3,169 Liberty engines.

More Liberty Contracts Offered

In spite of the fact that the Senate report gives the impression that the automobile industry gobbled the Liberty engine business to the exclusion of smaller concerns who were more fitted to do the work, the Government is now using every effort to get the automobile industry to accept additional orders for greater quantities of Liberty engines. The question immediately arises, why does the government not go to the concerns which the Senate report indicates should be the ones to manufacture these engines?

The answer is obvious, since it is well known that only concerns which are highly adapted for quantity engine production can enter the program with any hope of meeting requirements.

As production goes ahead, the cost on these engines is decreasing. This is always the case as the personnel becomes more skilled and the routing of the production is changed to meet the demands for better efficiency. It was for this reason that it has been possible to revise downward the figures on the Liberty engine cost.

As pointed out last week, this started at $6,000 and was afterward reduced to $5,000, which was set as the bogey figure. These contracts are now under process of revision to fix the cost price as $4,000.

Cost of the Liberty Engine

IT IS UNDERSTOOD THAT A CLAIM IS SOON TO BE MADE THAT THE AUTOMOBILE INDUSTRY HAS BEEN FORCED TO TAKE $1,000 LESS FOR THESE ENGINES. THIS IS NOT TRUE.

The truth of the matter is that the government according to its contracts is given 75 per cent of any saving below the bogey cost of $5,000, so that when the cost is reduced to $4,000 the saving to the government is $250 per engine, as the $750 would be turned over to the government, anyway, due to its original contract.

The original Aircraft Production Board has been criticized for making incorrect engineering decisions. This cannot be true, as the original Aircraft Production Board had no executive power. It was simply an advisory board and did not have an engineering staff, such as would be required for making determinations as regards materials and design. An idea of the limited functions of the board, which was really a clearing house for the army and navy aircraft divisions, may be gained from the fact that out of the total of $640,000,000 appropriated the board had the spending of $100,000.

Delay in Adopting Foreign Types

Considerable curiosity is displayed in the industry regarding the cause of a real delay in adopting foreign types. A careful survey of the situation indicates that there are two real reasons for this. In the first place, the foreign governments, feeling that after 3 years of indecision on our part in entering the war it was unlikely that we would enter immediately heart and soul into the conflict, were rather dubious about turning over their plans to us. It was not until this country really showed that it had entered fully into the struggle with all its resources that real co-operation was extended. There is no criticism attached to this, as it was but natural. Knowing the history of America in the automobile business, French manufacturers wanted to be assured that in giving us all their secrets they were not simply furnishing us with information that would allow us to take a dominant position in the airplane industry after the war. It is known that confidential bulletins to this effect were circulated among the French manufacturers, and it is no discredit to their patriotism or business acumen that this was done. It must be remembered that at that time this country had not fully proved itself.

Throughout the entire situation it must be borne in mind that conditions now are altogether different from what they were 6 months ago. The success of the Liberty engine and its development by the automobile industry have been the real causes which have opened the door of foreign assistance.

Would Not Listen to Experts

On the other hand, it is claimed that we would not listen to the advice of foreign experts. The testimony of those who had actual experience in foreign manufacture was not seriously heeded, and this accounts for delays in adopting types of planes like the Caproni, which is now proving itself of the greatest value.

RIGHT AT THIS TIME THE PLANE DESIGNED BY THE FRENCH COMMISSION UNDER CAPTAIN LE PERE, WHICH IS CLAIMED BY MANY EXPERTS TO BE THE BEST TWO-SEATED COMBAT PLANE THAT HAS EVER BEEN DESIGNED, IS APT TO BE TURNED DOWN. The reason given is that it necessitates a slightly different manifolding system for the Liberty engine. It is claimed that this would interfere with standardized production, although it does not affect the engine itself in any other way except for the manifolding. In the light of past experience, let us go slowly on discarding a plane which seems to have excellent production qualifications besides giving a performance which is a delight to pilots for speed and climbing ability.

One feature that has been clarified considerably by the report of the subcommittee of the Committee

on Military Affairs, U. S. Senate, is that relating to the troubles with the Bristol fighting plane, which was practically adopted and recommended for production by the committee sent abroad in the summer of 1917 to select the best type of fighting plane to be built in America. The committee selected the Bristol and a sample machine was shipped from Europe to Washington, where it arrived Sept. 1, 1917. At that time the go-ahead was given and the work turned over to Lieut.-Col. Clarke, who had a set of British drawings from the factory to assist him.

Lack of Co-operation

From that date forward the story of the Bristol development until the cancellation of the contract a short time ago, after an expenditure of $6,482,000, is nothing but an unpleasant tale of lack of co-operation among the various interests involved, and apparent delays which it is impossible to explain and which the committee making the investigation has made no effort to explain. The following chronology serves as a panorama of the development of the work on the Bristol from Sept. 1, 1917, until the cancellation of the contract.

Before taking up this chronology a few facts regarding the Bristol should be understood. As built in England the fuselage was arranged for a 190 hp. Rolls-Royce engine, but when its manufacture in America was decided upon, the Liberty 12 was selected as the power plant, and in Septembeer, 1917, the Liberty 12 was in the earlier processes of development and it was 4 months later before it was emerging from its constant succession of changes.

In fitting the Liberty 12 there was considerable increase in weight, approximately 185 lb. in all. The Rolls-Royce engine weighed 615 lb. and the Liberty 12 would range from 800 lb. up. This increase in weight added very considerably to the pounds per square foot of wing area that the planes would have to carry. The Bristol had a wing area of 450 sq. ft. and with its complete weight at approximately 3700 lb., which included all equipment, it had to carry or support 9.2 lb. per sq. ft. of wing area. If the area of the tail portion were added, this weight per square foot would be reduced to 8.25 lb. This load is very heavy when it is appreciated that the French Spad, from which the English Bristol was an adaptation, has a load of 7.3 lb. per sq. ft. and the D.H. 4, or De Haviland bombing plane, has a load of 6.1 lb. per sq. ft.

Extra Load Factor in Failure?

It does not appear whether this extra load which the Bristol had to carry was a prime factor in its failure or not, but when the early test flights of the Bristol were made at the Curtiss factory it did not carry its equipment and the machine flew with a total weight of 3000 lb., whereas its weight when fully equipped would approximate 3700 lb.

Perhaps the greatest trouble with the adapting of the Bristol to American ideas and to the Liberty engine resulted from a failure to have experienced, qualified men engaged in the work. It was necessary to make numbers of changes due to the difference of length of the engines, as well as the differences in weight, and there was a lack of good, practical aviation experience in this, the work being done by men who had a lot of theoretical information but were sadly lacking in practical experience.

About the middle of October the best airplane designer, who was a real practical man, left the job, because he was not willing to work with those connected with the Liberty engine program. The work was then turned over to a designer who, while he had a good theoretical education, seems to have been lacking in practical experience.

In addition to this handicap in the question of design, there were not a few other difficulties that caused delays. The work of adapting the Bristol after starting in Washington, Sept. 1, 1917, was moved from place to place, and on Nov. 1 it was decided to ship the Bristol plane and all blueprints to the Curtiss factory at Buffalo, where the work was to be done. On Nov. 17, 2000 of the planes were ordered and the work was supposed to be pushed ahead. The report contains letters indicating delays due to the fact that instead of a separate department being given over at the Curtiss plant for this work, it was for quite a time carried on in the open factory, which resulted in numerous delays.

Many Other Delays

There were many other delays in connection with blueprints. In one case these were held up for a week when the department was moved from Washington to Dayton. There was another delay when part of the organization was moved to McCook Field in Dayton.

The first Bristol machine was flown at the factory on Feb. 28, and the next day when the wings were removed it was found that two wing beams were ruined where holes for hinge pins had been drilled off, necessitating new wings.

When the Bristol was taken to the flying field on March 2 the wings were damaged on the way to the field. The flying field was in a very poor condition and there was trouble with the oiling system on that date. There was no heat in the hangar, no telephone, no spare parts, or portable tools, and drilling had to be done by hand.

On March 5 the first real flight of 5 min. duration was made, but the plane flew with only 3000 lb. weight, not having any equipment. It had to come down, due to engine trouble, sooted spark plugs, and the landing gear was broken.

It was expected that a new landing gear would be arranged and another flight made in a few days, but it was March 22, or over 2 weeks, before another flight was made. One time there would be no pilots, another time it was bad weather, and another time the field was in poor condition.

On March 22, a 15-min. flight was made.

On March 24, the machine flew 1 hr., attaining an altitude of 10,000 ft. and a maximum speed, with a cross wind, of 121.5 m.p.h. The report does not state whether the machine flew with a 3000-lb. total weight or not on this occasion.

Four days later the Bristol caught fire on the flying field and was badly damaged, and it was on April 5 before a new machine could be had to replace the old one.

While this rather incomplete testing program was being carried out various changes had been made. On Jan. 27, thirty-five changes in construction were approved by those in charge of the work.

The report shows that for periods of 8 days there was very little speed in production due to errors in construction and changes in parts.

While this whole course of development was proceeding the army officials of the Signal Corps seemed to be impressed with the fact that the Bristol was one of the best machines. Extracts from the report show that on Jan. 9, when those in charge of the work were at Buffalo, they reported that the Bristol fighter we were copying was very successful. As late as Feb. 13, another army officer reported that the Bristol construction and design was very satisfactory on the Western front. It was in March and April when rumors began to leak out regarding the failure of the Bristol plane. Some accidents occurred and various reports were circulated as to the reasons for these. It was the general feeling that the original British machine which was copied was at best a tricky type, but that in the American adaptation these characteristics were intensified, making the machine really unsafe.

The report states that the constant effort to change from the tried-out Bristol principles of design and to inject changes of construction to cover careless workmanship or poor materials were responsible for the failure of the job. This, coupled with a lack of concentrated experienced inventive engineering ability, in perfecting the undeveloped features of design incident to the changes, seems to complete the long list of reasons for the signal failure of the job. The report shows that all changes in design were crude.

Problems Involved in Bomb Sight Design

Bombs When Released Acted On by Three Forces, Momentum, Gravity and Air Resistance—Wind May Also Be a Factor—Present Bomb Sights Require the Manipulation of at Least Three Scales and Are Too Complicated

By a Member of the British Aircraft Mission

THE following notes form a brief discussion of some of the outstanding features of bomb sighting; it is not possible to discuss the question exhaustively in a short article, but it is hoped that the main features are clearly dealt with.

Let us consider a bomb attached to an aeroplane in such a way that its axis is parallel to the longitudinal axis of the machine; the bomb is said to be horizontally suspended. In order to make matters quite definite let us assume that the aeroplane is travelling at 100 ft. per sec. (about 70 miles per hour), is flying at an elevation of 6000 ft., and there is no wind.

Trajectory of Falling Bombs

When the bomb is released by the pilot it falls to the ground along a curved path called its "trajectory." The forces acting on the bomb are three in number: (1) its horizontal forward momentum, due to a velocity equal to that of the aeroplane to which it was attached, (2) the pull of gravity. This force acts vertically downward and gives the bomb an acceleration of 32 ft. per sec. per sec., (3) the resistance of the air. This force acts along the longitudinal axis of the bomb. The air resistance can not be neglected in the design of bomb sights, but since the effect it produces on the trajectory is not very great, we may, for rough calculations, leave it out of account at first.

Considering then the two first forces, we have a horizontal forward velocity of 100 ft. per sec. and a vertical downward acceleration of 32 ft. per sec. per sec. By means of the simple laws of mechanics we can make the following table:

Time from moment of release, secs.	Horizontal Travel, ft.	Vertical Travel, ft.
0	0	0
1	100	16
2	200	64
3	300	144
4	400	256
19.4	1940	6000

If we plotted these figures, or even by comparison of the figures themselves, we should see that they conform to the well known curve known as a parabola ($y^2 = 4\,ax$). Only half the curve is present, since the bomb starts from the apex at the moment of release. The "x-axis" is vertical and the "y-axis" horizontal.

We have therefore established that under ideal conditions of no air resistance, the bomb follows the curve, common to all projectiles, of a parabola.

Air Resistance Causes Trail

Consideration of the effect of air resistance leads us to the conclusion that the bomb will take a little longer to reach the ground and will not travel quite so far forward as it would under the ideal conditions. It will be easily seen that under the ideal conditions, if the aeroplane kept straight on after it had dropped the bomb, the bomb would remain always vertically underneath the machine, since it is travelling forward at the same pace as the machine. That this is very nearly the case may be proved by watching a bomb drop through a hole in the floor of a machine. It will be noticed, especially at big

heights, that the bomb does lag behind a litle. The distance between the point on the ground vertically under the aeroplane and that where the bomb actually strikes is called the "trail" of the bomb. The distance is very roughly 4 per cent of the height from which the bomb was dropped. Thus in our case the "trail" would be about 240 ft. The air resistance, and in consequence also the trail, varies with the type of bomb, being smaller for bombs of a good streamline shape than for those whose shape is bad.

From this it may be seen that the trail of a bomb is a most important factor and must always be taken into account in designing a bomb sight. In the rough outline which follows, for simplicity's sake the trail has been neglected. From tables which have been calculated in England both from theoretical and practical considerations, it is merely a matter of calculation to apply the necessary corrections.

The bomb then travels along a parabola, the apex of which is at the point of release. The bomb sight has got to tell us when we are at the right point for release.

Effect of Wind

At the beginning we assumed that there was no wind. This is, however, never the case in practice, and it must be borne in mind that the bomb follows not the air speed, but the ground speed of the machine. If A is the air speed of the machine, W the wind speed and G the ground speed of the machine for upwind bombing, we have $G = A - W$; and for downwind $G = A + W$. We therefore see that for determining the point of release we must know (1) the height of the machine, (2) the ground speed. The height we know from the aneroid. The air speed of the machine we know from the air speed indicator, but the wind speed is generally not known. How then is the ground speed to be determined?

Three methods have been used from time to time:

(1) A direct observation by stop watch of the time taken to pass between two objects whose distance apart is known.

(2) Observation of the drift of the machine when flying at right angles to the wind.

(3) Determination of the velocity of the wind by observing the movements of Archie gunfire bursts or balloons.

Method (1) is laborious and, involving as it does the use of a stop watch, is not to be recommended.

Method (2) is fairly easy to apply at low heights, but at great heights presents considerable difficulties.

Method (3) is perhaps the ideal method, and, since it enables one to find the velocity of the wind above the clouds, is probably the method of the future.

Any of the methods may be checked by means of the use of a spotting bomb, the "sighting shot" of the rifle range.

Three Scales to Operate

Up to the present time even the best bomb sight in use has had three scales to manipulate: one for height, one for air speed and one for wind speed. All these three only determine an angle, the angle subtended by the target at the point of release, which is the thing that we are after all the time.

It is probable that in the near future the scales will be reduced in number to one, a scale of angles only. Not only will this enormously simplify the work of the pilot, but in addition it will render the application of corrections determined by the use of spotting bombs very much easier.

Having now determined the point at which to release the bomb, we have got to find out how to get to this point, and this is the most difficult part of bomb sighting.

The whole difficulty lies in determining in the air the direction of the true vertical.

It is comparatively easy to keep an aeroplane flying level fore and aft. The difficulty is to keep it level sideways. A pilot will often get one wing as much as 6 deg. down without noticing it and this, at the height of 15,000 ft., will put the apparent vertical over 500 yards to the side of the true vertical. The application of gyrostatic devices is not easy. The instruments are so delicate that they are easily put out of action in the air and also require much attention. In addition they are very expensive. It is probable that the use of a simple sight involving the use of a short period pendulum will prove to be the sight of the future.

The foregoing remarks have given a brief and extremely sketchy outline of the principles underlying a bomb sight. Much ingenuity has to be used in putting the principles into practice in designing a sight. The great features to aim at in bomb sight design is simplicity in design and ease of manipulation in the air. A pilot cannot make use of instruments which require him to go through complicated actions in the air. There is a tendency also from time to time to make clockwork sights; these are based on a fallacy, since the ease of running of the clockwork depends to a quite unknown extent on the temperature of the oil used for lubrication. This introduces such complications as to make the sights useless.

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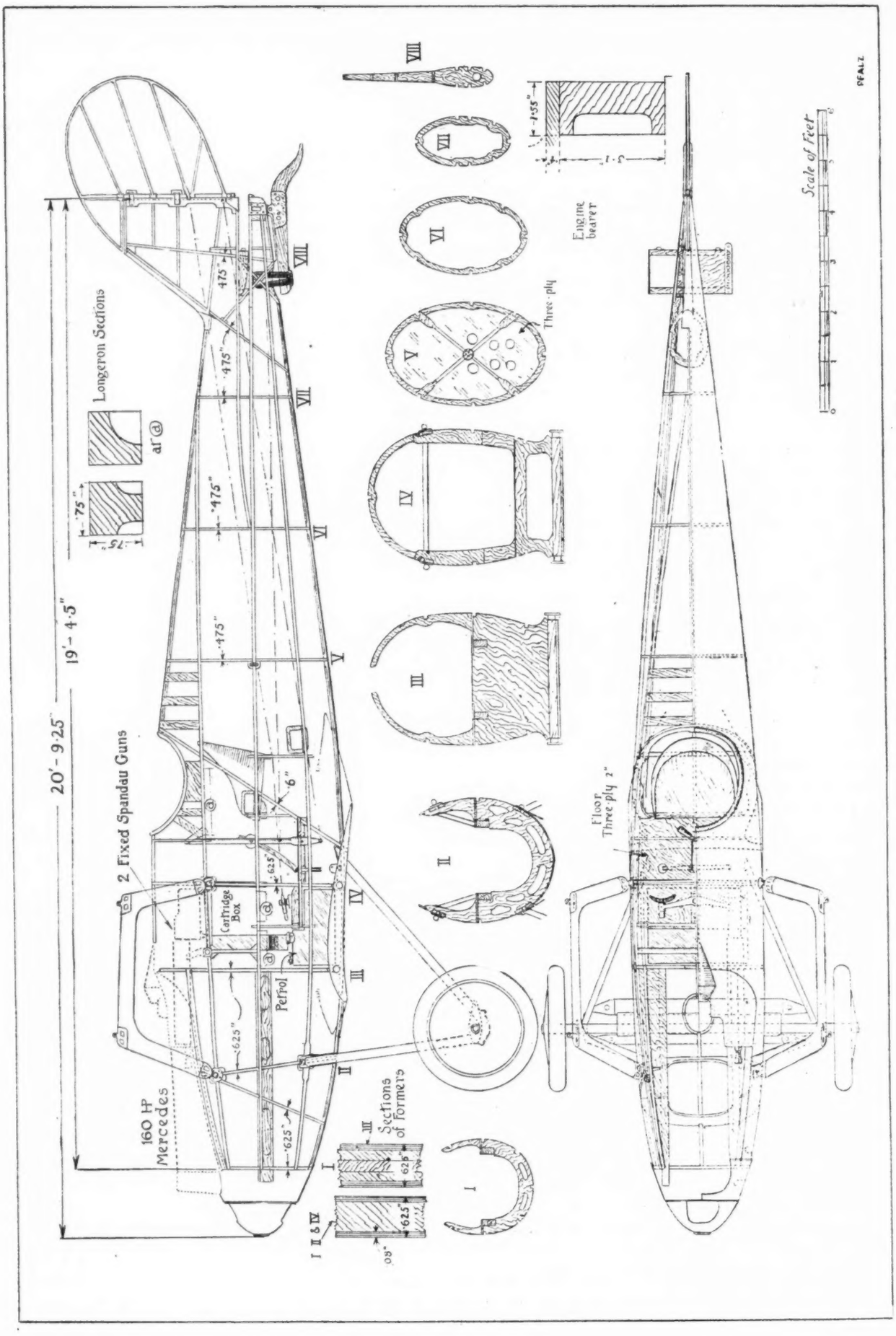
The New French Tanks

SOME details of the new French tanks have reached us by way of London. They are of small size and have been referred to as mosquito tanks. Their construction is very much along automobile lines. In front sits the driver, protected by armor plate all around except for very narrow slits to give him enough of a view to drive by. A gunner occupies a turret at the middle of the machine, and the armament consists either of a gun or a machine gun.

An Argument for Protection Against Dust

AND a demonstration of the need for air cleaners. The speed of the tractor has developed many new problems for the designer of farm machinery of which none is more important than the protection of wearing surfaces from dust and mud. The happy medium between these two almost never exists. The speed of the moving parts makes either a more dangerous agent of destruction.



Scale drawings of the Pfalz fuselage in plan and elevation

Details of the Pfalz Single-Seater

Performance Records Obtained in England—Machine Is of the Plane-and-a-Half with Vee Struts—Body Construction of Plywood Formers and Covering

IN the June 6 issue of AUTOMOTIVE INDUSTRIES we published the specifications and some general information regarding the Pfalz single-seater scout. Recently a detailed description of the machine with numerous illustrations appeared in *Flight* of London, from which the following is culled. The description was obtained from a machine at the Enemy Aircraft View Rooms.

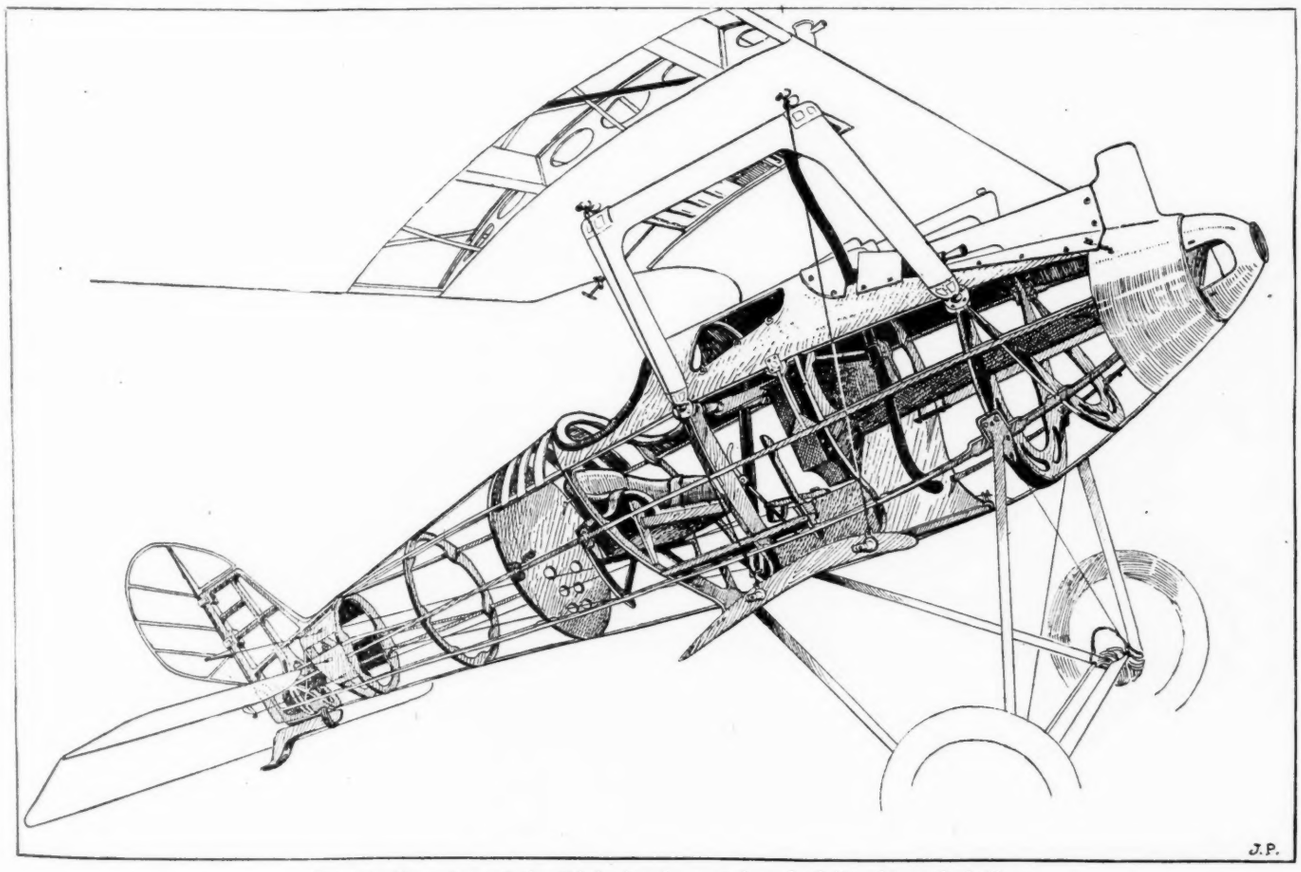
About a year ago German aircraft firms began to pay more attention to cutting down head resistance of their machines. Thus the Albatross firm turned out some single-seater fighters, incorporating the Nieuport type wing bracing and the semi-monocoque body of streamline shape. It was on machines of this type that the pilots of the "Richthofen Circus" did much of their fighting. Then there was the Roland fighter, in which attempts were also made at streamlining the body, but which went rather farther and made the body so deep as to serve directly as a support for the top plane. Finally we have the Pfalz, in which streamlining has been carried a little farther still, inasmuch as the attachment of the lower wings takes the form of wing roots formed integrally with the body and the object of which is presumably to avoid sharp corners at the juncture of wings and body. The wing arrangement of the Pfalz also differs slightly from that of the Albatross in that the inter-plane struts do not come to a point on a single lower spar, but are separated at their lower ends by a short horizontal piece, evidently so as to enable the struts to take care of the twisting moment due to the travel of the c.p. better than can be done with a point attachment.

An examination of the Pfalz biplane gives the impression of very low resistance indeed, and with an engine of 160 hp. one naturally expects the machine to have an excellent speed. Tests carried out in England do not, however, confirm this first impression, and the following particulars of performance can only be regarded as disappointing in view of the promising appearance of the Pfalz.

Performance Criticized

The rather unsatisfactory performance may be explained by figures given in the table. The body appears to be of good streamline form, but against this must be placed the fact that the maximum cross sectional area is comparatively large, owing to the deep body reaching nearly to the top plane. As regards the wing bracing, this is simple enough as far as concerns the number of wires and struts, but the cables are not faired, and as they are of rather large diameter, their resistance at maximum speed may reasonably be assumed to be fairly high. If, however, the detrimental resistance is considerable, the wing resistance is probably no less so, the wing section being of the deeply cambered type so favored by German designers, and which has, generally speaking, a somewhat high drag, although its lift is good.

Constructionally the Pfalz single-seater is even more interesting, showing, as it does, considerable departures in detail design from other German makes of the same class, on which its fundamental arrangement is evidently founded. This refers especially to the Albatross fighter single-seater, which is



Perspective view of the Pfalz fuselage stripped of its plywood shell

characterized by the same main features, such as large top plane and small bottom plane, one pair of interplane Vee struts on each side, plywood, streamline body, etc. Apart from minor differences in shape, the Pfalz designer has chiefly struck out along original lines in the construction of the body. Whereas in the Albatross one finds the same oval formers connected by longitudinal rails, the manner of applying the three-ply covering is totally different in the two machines. In the Albatross the plywood is put on in small pieces covering only a bay or so; the covering of the Pfalz is in the form of long strips spirally laid on, the strips of the two layers forming an angle with one another.

According to the official report on the tests the following data were established:

Pfalz Scout, No. G. 141

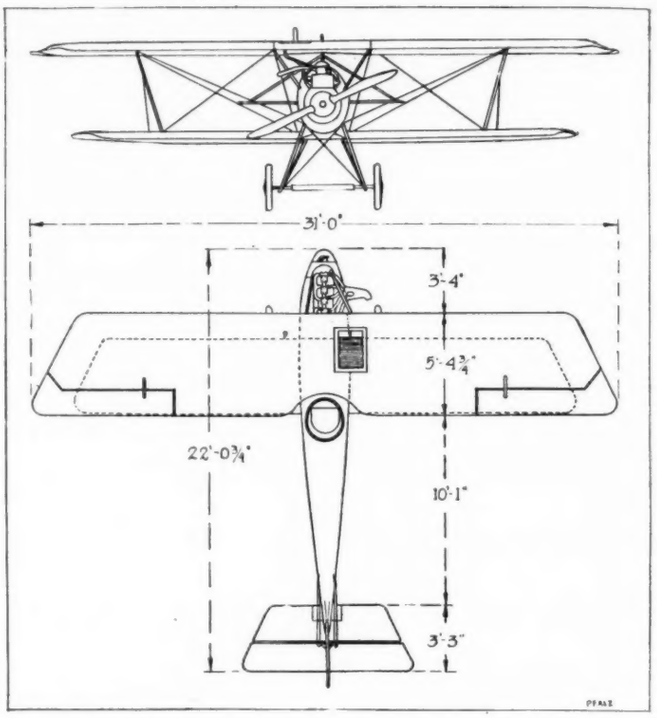
Engine	160 hp. Mercedes.
Number of crew	One.
Military duty	Fighter.
Propeller	Axial, Berlin.
Total military load	281 lb.
Climb to 10,000 ft.	In 17 min. 30 sec.
Speed at 10,000 ft.	102½ m.p.h.; rev., 1,400 r.p.m.
Rate of climb	360 ft./min.; rev., 1,310 r.p.m.
Climb to 15,000 ft.	In 41 min. 20 sec.
Speed at 15,000 ft.	91½ m.p.h.; rev., 1,325 r.p.m.
Rate of climb	100 ft./min.; rev., 1,280 r.p.m.
Estimated absolute ceiling	17,000 ft.
Greatest height reached	15,000 ft. in 41 min. 20 sec.

The total military load is made up as follows:

	Lb.
Pilot	180
Two Spandau guns	70
Dead weight	31
Total	281
Weight per sq. ft.	8.56
Weight per hp.	12.84
Total weight of machine, fully loaded	2,056
Weight of machine, bare, with water	1,580
Military load, less crew	101
Crew, as above	180
Fuel, 21½ imp. gal.	155
Oil, 4 imp. gal.	40
Total	2,056

There are in all eight longerons at the top, one at the bottom, one half-way up on each side and four at what would be the corners in a rectangular section body. These longerons run the whole length of the body, with the exception of the top one, which is terminated just to the rear of the engine, and are attached to the formers as shown in the sketch. The longerons are stop-chamfered so as to leave them solid at the formers, into which they are sunk and secured by a wood screw. The formers themselves are built up of smaller pieces of spruce, lap-jointed and covered each side with a facing of three-ply wood.

Reference has already been made to the fact that wing roots are formed integrally with the body. These roots account for the peculiar shape of formers III and IV. Judging by these formers the cross-sectional area is unduly increased at this point, although this may partly be made up for by the shape of the plywood covering, which merges the lines of the lower plane into the curves of the body. It is, perhaps,

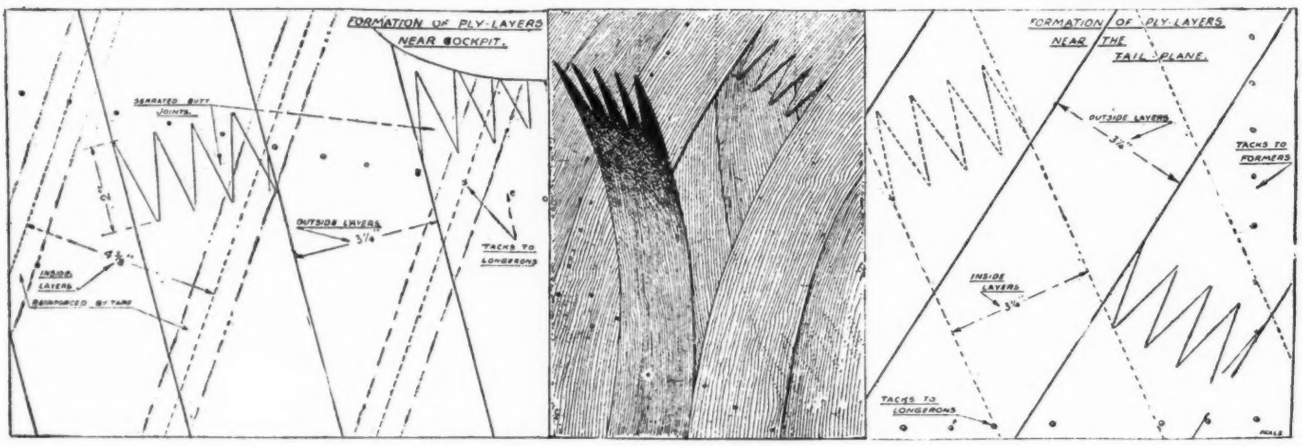


Plan and front elevation of the Pfalz

open to doubt whether or not this elaborate arrangement is worth while. Constructionally it must necessarily entail considerable extra work, and aerodynamically it does not look as neat and efficient as the Albatross way of doing the same thing by frankly letting the bottom plane abut directly on the curved sides of the body.

From the perspective view of the Pfalz body, it will be noticed that some of the formers are sloped in relation to the others. Thus, for instance the former in the neighborhood of the pilot's seat slopes back so as to bring it approximately into line with the rear chassis struts, while rigidity is lent to the front portion of the body by sloping one of the formers carrying the engine bearers until its top meets the top of the next former. In this point also the formers are joined to the front struts carrying the top plane, while one of them serves, at the point of attachment of the bottom corner longeron, to transmit the load from the front chassis struts.

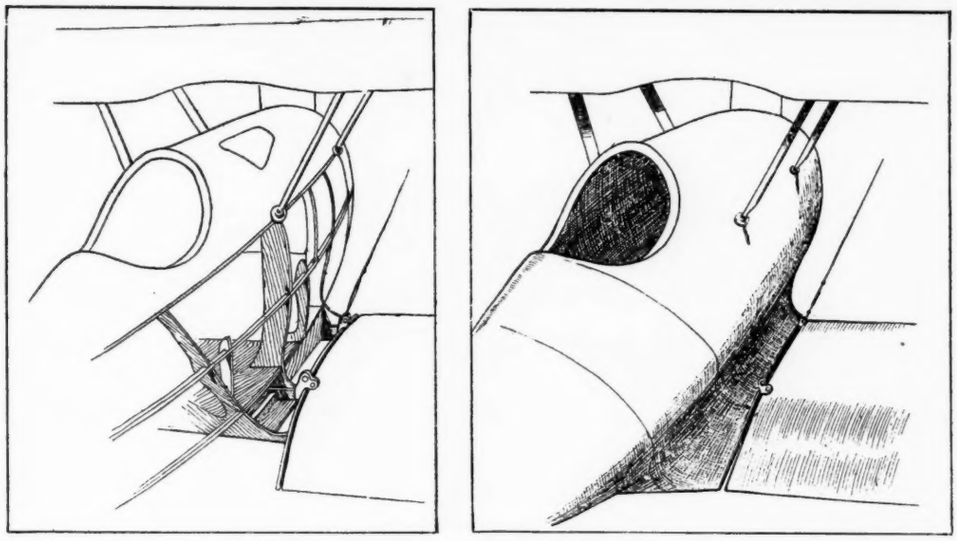
One of the difficulties of monocoque body construction has always been that you cannot bend three-ply sheet over a double curvature. That is to say, in sheet form the three-ply will bend willingly to the curvature of the converging sides of a flat-sided body; but as soon as the sides are no longer flat but have a curvature however slight, three-ply in sheet



Illustrating the method of covering the fuselage with plywood

form cannot be employed. In the Albatross this difficulty is overcome by using small sheets, covering only one bay, and forming, in reality, although it is not noticeable, a series of straight bays. In the Pfalz a different method has been employed. The body covering consists of two layers of three-ply, each less than 1 mm. thick. The plywood is evidently manufactured in sheets, and before applying to the body is cut up into parallel strips of about 3 to 4 in., the width apparently varying considerably throughout the body. The first layer of three-ply is then put on by bending it diagonally around the body, attaching it by tacking to the various longerons, en route, and cutting each narrow strip at the top and bottom longerons, which form the terminals, so to speak, of the three-ply covering, which is thus applied in two halves. The second layer of strips is then laid on top of the first, but at a different angle, to which it is secured by gluing, and finally tacked to the longerons. The inside layer is reinforced, in the front portion of the body, by gluing tapes over the joint between adjoining strips of plywood. This and other details are shown in one of the illustrations. In order to spread a joint in the plywood over as large an area as possible the joint is made, as shown, in a sort of saw tooth or serrated butt joint style. This, in brief, is the fundamental construction of the Pfalz body, and differs considerably from other makes. The weight can scarcely be any greater than the girder type of body, but as regards strength we have no information. As a compromise between sheet three-ply covering and true monocoque construction the Pfalz method would appear to have certain advantages.

(To be continued)

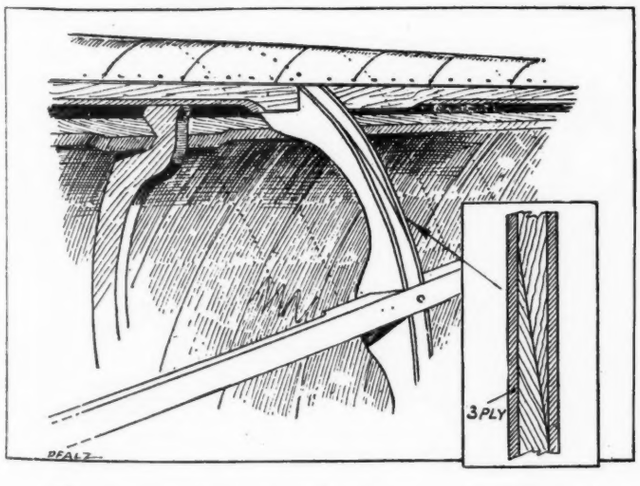


The wing roots or stubs of the Pfalz

British Dope Investigation

IT hasn't been all smooth sailing in carrying through the aircraft programs of foreign countries, as is well shown by a recent report of a Select Committee on National Expenditure dealing with the dope situation.

In the early days of the war cellulose acetate was not manufactured in England. The principal sources of supply, apart from Germany, appear to have been the Usines du Rhone, at Lyons, and the Cellonite Company, Basle. Private manufacturers obtained it from either of these two sources, but the War Office do not appear to have obtained it direct from the Usines du Rhone until late in 1915, after which date, however, the product from those works was regarded as superior in quality to that of the Cellonite Company, Basle.



Illustrating shape of body former and method of securing longeron to it

Inquiries were made by the War Office early in 1915 regarding the possibility of manufacturing cellulose acetate in England. After preliminary negotiations with several companies tender forms were issued to three firms in July, 1915, for 100 tons of cellulose acetate to be manufactured in England, the manufacturers to state on their tender form to what extent the ingredients would themselves be manufactured there. Of the three companies invited, the Cellonite Company of Basle alone submitted a tender.

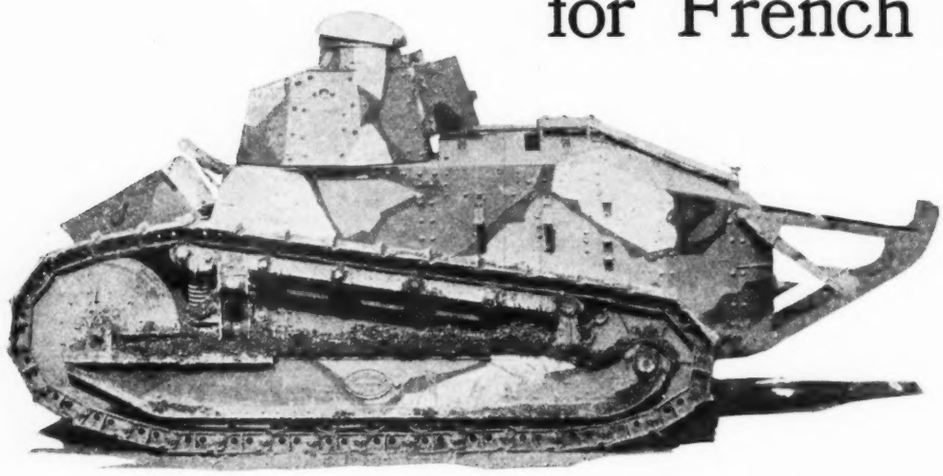
The Cellonite Company of Basle submitted a tender in which they undertook to manufacture in England within six months, but reserved the right to supply up to 50 per cent of the total quantity required from their works in Switzerland.

The Cellonite Company's tender of July, 1915, was accepted by wire on the 19th of July, and negotiations immediately followed for the institution of the required manufacture in England. The representative of the Swiss company, Dr. Camille Dreyfus, at once raised the question of the effect upon the undertaking of possible excess profits taxation, and asked for some assurance that it would not be applied to this new venture. This question was referred by the Contracts Branch, through the Director of Military Aeronautics, to the Finance Branch, and met with an absolute refusal, which was communicated to Dr. Dreyfus. It was finally agreed, however, that the Government would refund the amount expended on plant by the company, up to a maximum equivalent to the excess profits duty actually charged in respect of each year's working during the war.

It appears from the report that as a result of this agreement the company went ahead spending money on plant lavishly, but its product left much to be desired both as to quantity and quality. It enjoyed a virtual monopoly and hence was in position to fix its own price. The agreement with regard to the refund of capital expenditure was cancelled in June last, and now it is proposed by the committee that the Government should take over the entire works of the concern, the British Cellulose Company, that a technical committee be appointed to advise upon the necessary steps for the completion of the factory and its efficient management, and that the Government consider immediately the advisability of securing an alternative source of supply of cellulose acetate.

The report concludes: "A private monopoly in a key industry cannot be instituted at Government expense or with Government assistance without arousing criticism and, if only for this reason, the Supply Branch would have been better advised to have secured the full authorization of the Finance Department at every step in their negotiations."

Renault Builds Light, Speedy Tanks for French Army



French 2-man tank, which has a speed of 12 m.p.h. and can turn in its own length. The tank is built in the Renault automobile factory and has a 4-cylinder, 40-hp. engine

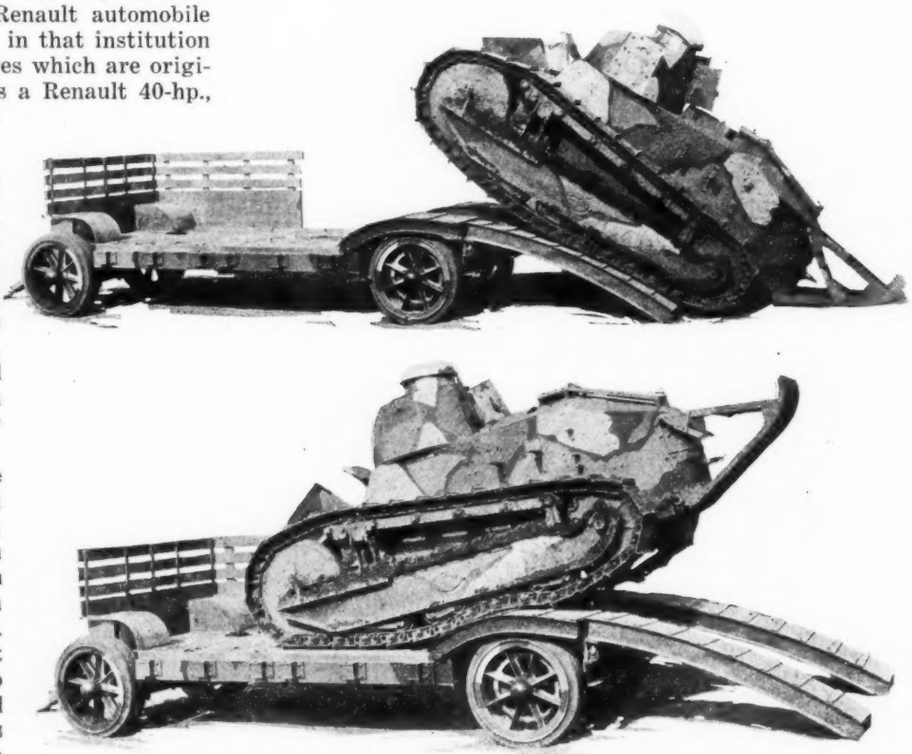
RECENT attacks by the French and British have been preceded by great numbers of two-man tanks. These light tanks have been frequently mentioned in dispatches from the front of late and have proved to be a great success in preparing the way for infantry advances. The tanks shown in the accompanying illustrations are those used by the French and have been an important factor in the late offensive of the allied armies. The tank is the production of the Renault automobile factory, having been designed largely in that institution and incorporating a number of features which are original with this concern. The engine is a Renault 40-hp., four-cylinder design, and the track-laying drive is also a distinctive Renault design.

The driver is located at the front end of the machine and the observer, or gunner, is seated in the center or stands upright within the turret. The driver and the gunner both look through slits cut in the armor plate of which the body work is composed, and the turret is mounted on ball bearings, enabling the machine gun carried within it to be pointed in any direction around the entire circle.

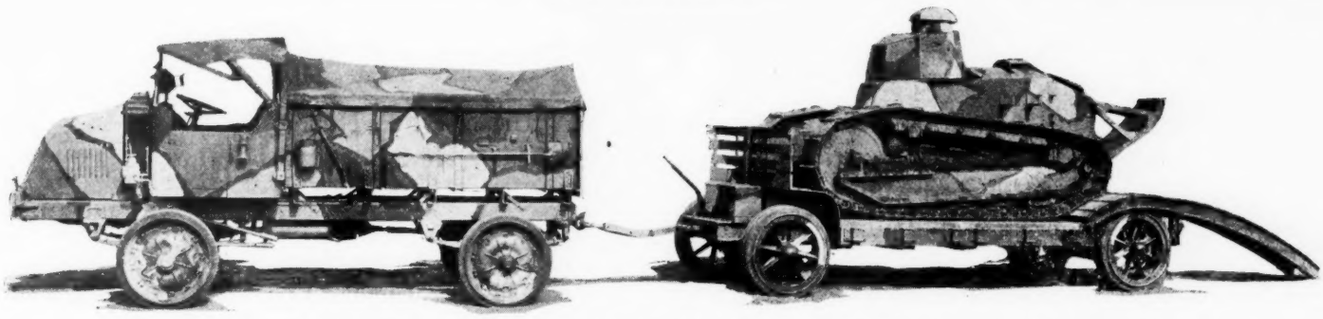
The engine is in the rear of the tank, and propels the vehicle through a clutch and a transmission gearing; then to a transverse shaft through two steering clutches, finally to an outbound reduction gearing, and then to the sprocket which drives the track. The track differs materially from that used on the former tanks and is also considerably different from that used on the caterpillar tractors of this country. The track is driven by a sprocket gear at the rear end and passes over a blank gear, or idler, at the forward end. The adjustment of the track is maintained by the position of this idler, which governs the center distance from the center of the sprocket to the center of the idler. The tension is also maintained by a roller track frame which is forced upward against the inside of the upper links by means of a coil spring.

The body of the tank is hung between two track frames. The track frames are inverted U-beams containing the track drive mechanism. The body is suspended at the rear by means of the drive axle, which passes transversely through it and holds the sprockets on either side, and is also supported by large coil springs on the brackets which connect the body to the track frame at the forward end.

This tank is capable of a forward speed of about 12 m.p.h., and has four forward speeds and one reverse. It can be whirled about in its own length by holding one of the tracks stationary, while the other propels it



The engine is at the rear, the track differs materially from the usual type and the turret is mounted on ball bearings, enabling the machine gun to be pointed in any direction



In cases of emergency the tank is loaded on a trailer and hauled to the threatened point. Its weight of 6 tons enables this to be done with ease. The armor plate is sufficiently thick to withstand machine gun or rifle fire

around the stationary track as it pivots. The release and engagement of the tracks is controlled by means of steering clutches which are interposed between the transmission and the spur gear reduction which drives the sprockets.

The tanks are fitted with a tail piece on the rear end which permits them to go up inclines almost vertical without tilting over backward. They can negotiate very rough ground and are comparatively light for this sort of service. The weight of the Renault tank is about 6 tons. It is built throughout of armor plate sufficiently heavy to withstand machine gun or ordinary rifle fire. The ability of these tanks to wipe out machine gun nests and in some cases even capture light field artillery pieces has been greatly responsible for the success of recent French attacks. The Whippet type of tank, which has been mentioned frequently in dispatches of late and is even credited with having chased a brigadier-general from his headquarters, is no doubt an English type corresponding very closely to this Renault design.

Women Industrial Workers in France

THE French have not, as the British have, established training courses and factories in which women are prepared to take up skilled work. At the outset, says Mary Conyngton in a report printed in the Monthly Labor Review of the U. S. Department of Labor, they were trained, as far as any training was needed for what they did, by the men with whom they worked. Later on, when it was desired to put women to work demanding a little more skill, the same method was adopted as in England at the beginning of the war—a group of women were put on machine work, a man being told off to supervise, to keep the machines in order, to adjust and repair tools, and generally to do what the women were not capable of doing themselves. In other cases a woman would be set to work as a helper to a man; sometimes she would be assigned to him as a kind of apprentice, being expected to pick up his work as rapidly as possible.

In March, 1917, the minister of armaments addressed a circular to the directors of artillery establishments, pointing out the need of training more workers for skilled operations and giving details of a plan for offering this training. Women, especially those who were young and had shown aptitude for the work, were to be included in this training. Even before this, occasional references had appeared in different ministerial circulars to women employed in work demanding both skill and training. Presumably these have been trained by individual employers for work in their own shops.

The necessity for intense production has led to the installation of automatic machinery and subdivision of labor, two conditions which are usually favorable to a good production on the part of women. Where strength is a requisite the women are said to be less effective than men, but where dexterity and swiftness count, their output is the better.

A former factory inspector of France, writing of the condition of French working women, says that the system of deductions from their piece rates on account of improved devices or masculine help tends to increase their output.

At the lathes for 155-shells the women have been provided with pneumatic tackle, and for this reason get a "quarter less," while men have a higher wage because they handle the shells by hand. Yet the women succeeded in turning more shells in a day than the men. The women thus obliged to produce 125 pieces while the workmen produce only 100 force themselves continually. War industry has used women to speed up production. They have frequently set a new pace in factories where it was insufficient.

Officially France has not, up to a recent period, displayed much interest in the question of how the women engaged in these new occupations may fare at the close of the war. There has been some discussion of the matter by various writers on economic and social problems, in which some anxiety appears as to the effect of their competition in lowering wages, but the main concern has been as to the effect on the race of their economic emancipation. When the great increase in the employment of women began some writers argued strongly against the admission of women to the new and better paid occupations, stating frankly that if a woman can earn living wages there is little chance that she will marry, or, marrying, consent to bear children. The government, however, does not seem to share this fear, for it has lately called on the Committee on Women's Work to investigate and report on the best way of utilizing industrially the women who will be set free as the demand for munitions declines.

The committee, after taking counsel with trade-unionists, women leaders, social workers, and large employers, decided that the first step was to make a survey of the women at present employed, and of the demand likely to exist for their services at the close of the war. They have accordingly sent out to employers a questionnaire, asking each to return full details as to the number of women at present employed, with their industrial history, and also to give an outline of what plans the employer has for his own business after the war, stating how many women he will then wish to employ. The committee also asked for the opinions of those questioned as to the best steps to be taken in order that the "valuable collaboration" which women have given to munition work may be continued to the advantage of peace industries. The results of this investigation are not yet at hand.

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ACCORDING to *L'Industrie Electrique*, great difficulty is being experienced in France in getting sufficient platinum for electrical work, and the Société des Experts Chimistes de France has suggested a tax on all luxuries using this metal. Various alloy substitutes are proposed, including gold palladium, which costs about half the price of platinum, and certain nickel chromium and iron silicon alloys.

The Automobile Outlook in Holland

A Market Not Neglected Previous to the War—Native Industry Practically Non-Existent—Many New Fortunes Created May Lead to Big Demand When Peace Returns

By a Correspondent

HOLLAND is a small country with fairly good roads which, as a rule, are very narrow. The country is quite flat and in the greater part of the country the roads are paved with small brick, but in the southeastern part there are a few roads made of concrete.

Previous to the war, every kind of car, whether of English, French, Belgian, Italian, German or Austrian make, was represented in Holland, and practically all American cars too. Even American firms with no reputation in the United States were among those doing business in Holland. As a matter of fact, I do not know a single country in the world where more different makes of cars were represented than in Holland.

In my estimation the annual sales in Holland did not exceed 1,200 cars, and with the exception of a few makes which did a fair business, most of the makers sold from 1 to 6 cars a year in this country; competition, therefore, was very keen, as for one buyer there were at least 20 agents offering 20 makes.

The total number of motor cars in use in Holland is very difficult to get hold of, as the officials to whom I have addressed an inquiry several times do not want to give that information to me (a foreigner). They are evidently afraid that I would take advantage of the information.

I estimate the total number of cars in use in the Netherlands at between 6,000 and 8,000.

Up to the beginning of the war, only the very rich people made use of cars. Large numbers of Dutch people who could afford to buy a motor car did not think that their means allowed them to keep one.

War Put Stop to Imports

Since the outbreak of the war practically all importation of cars has ceased, although during the early part of the war the Germans did send, now and then, a few German cars to Holland and more recently they shipped a certain number of Belgian, French and even English cars which they had taken in Belgium or in the north of France and which they had put into proper condition in Germany. The Belgian, French and English governments having strongly protested to the Dutch authorities against these importations of stolen cars, such importations have practically ceased.

In the first year of the war, Holland did import a fair number of American cars, including Overlands, Cadillacs, Hupmobiles, Fords, Maxwells, Hudsons, Oldsmobiles and a few Packards and cars of other makes. Shipping difficulties have stopped these importations.

People in Holland who before the war would never have considered owning an American car (considered as a cheap car) have been compelled by the force of circumstances to buy such cars, and no doubt the American car is considered better now than before the war.

The automobile industry in Holland is only in its infancy. There really is only one works in the country manufacturing cars, and that only on a very small scale, namely, the N. V. Nederlandsche Automobiel-en Vliegtuigfabriek Trompenburg, Amsteldijk, Amsterdam. This company was established several years ago by Spyker Bros., an old coachbuilding firm. When the motor car industry started they began to build bodies for chassis made by other manufacturers, and later they decided to build a factory for the making of chassis themselves. They started in a small way and at one time were fairly successful, their products being sold throughout Holland and the Dutch East Indies, besides having a small sale in England.

One of the Spyker brothers lost his life a couple of years before the war when the steamer *Berlin*, belonging to the Great Eastern Railway Line, foundered off the mouth of the Hook of Holland Canal. The other brother not being in position to continue the business alone, this was turned into a stock company, and at present Henri Wynmaelen, the old flyer known from the "European Circuit," is managing director of the concern.

Building Aeroplanes Now

The Trompenburg company is now building aeroplanes for the Dutch government and is also trying to build cars; but under the present conditions this is quite impossible, no material being available in Holland and no importation of same being possible.

The capacity of the Trompenburg works, however, is very limited, and I do not think they can make more than a couple of hundred cars a year if they manufacture the units themselves. I have been told, however, that after the war they expect to build cars from units made for them in the United States.

Besides the Trompenburg factory, there is a small place called "Eysink" in Amersfoort which pretends to be a factory of motor cars but which is no more than a big repairshop. There is not even a first class repairshop in Holland capable of making new parts for modern machines if necessary.

Dutch people, although rich, are very conservative and do not spend their money so readily as people in other countries. They stick to their money and therefore Holland has certainly not had, up to the present moment, the importance it could have had as an automobile market.

It is possible that after the war, when cars can again be produced at low cost, and freight and insurance will be normal again, so that the American car can be sold in Holland at as favorable a price as in the United States, quite a new clientele for motor cars will be found in this country. This hope seems the more justified because a great many people who had no money when the war broke out have become very prosperous and want to spend their money when circumstances allow it.

Encouraging the Use of Coal Gas

WE understand that the offer by the Automobile Association of England of $5,000 for the best method of using coal gas on motor vehicles has aroused considerable interest. A number of inventions have been definitely entered for the competition, and, in addition, many valuable suggestions by motorists and others interested have been received by the Association. Incidentally, the competition has stimulated research and investigation concerning the possibility of using other fuels besides coal gas, gasoline and gasoline substitutes.

Welfare Work in a Rubber Plant

What Experience Has Demonstrated Regarding the Requirements of Rest Rooms and the Cost of Maintaining Them—A Hotel for Women Workers

A VERY complete system of rest rooms for girls has been maintained by the B. F. Goodrich Company at its plant in Akron, Ohio, for the past four years. A photograph of one of these rooms is reproduced herewith. It is quite evident that the Goodrich company has gone into this matter with characteristic thoroughness. It is also apparent, from the real luxury and good taste displayed in the furnishing of the room illustrated, that the company believes, when it comes to welfare work, that half measures do not pay.

Manufacturers will be interested in the cost of operating such rest rooms, and we are, therefore, giving the figures for the room shown in the photograph as furnished us by the Goodrich company. The following table of costs gives an idea of the maintenance expense on an annual basis:

Dimensions of room	20 x 80 ft.
Rental at 43 cents per sq. ft.	$688
Light	25
Heat	75
Furniture depreciation (original cost $900)	225
Magazines	30
Music and victrola records	20
Total annual cost	$1,063

Experience justifies an annual depreciation of 25 per cent on the equipment, and it is considered a mistake to economize too stringently in purchasing the requisite material.

According to the Goodrich company, the chief factors to be considered in the construction and maintenance of a girl's rest room are: Good ventilation, light, spaciousness and quietness. A minimum of 12 sq. ft. per person is considered essential.

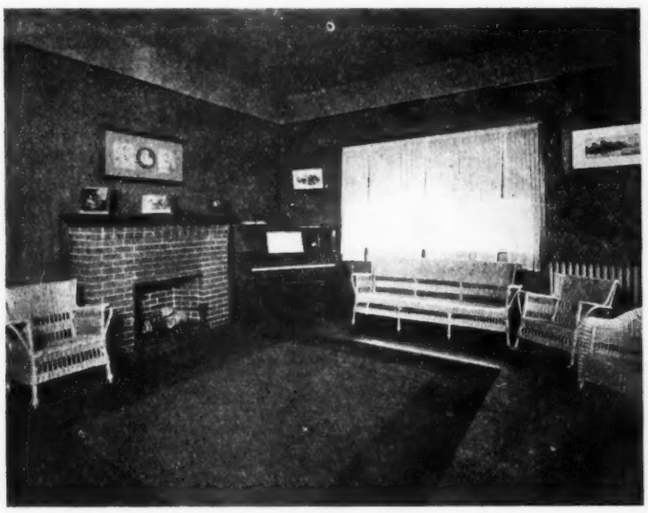
While there is but one window in the room illustrated, additional light is secured through skylights and, furthermore, the partitions on two sides of the room do not extend to the ceiling. It is generally considered best, wherever possible, to have rest rooms on the outside of the building so that the girls may look out of the windows and rest their eyes by using them for distant observation. Eyestrain from constant close work is a common cause of nervous disorders.

The room illustrated will serve for approximately 300 girls per day. There are, of course in addition, other rooms where cots are provided to permit complete relaxation for those who require it.

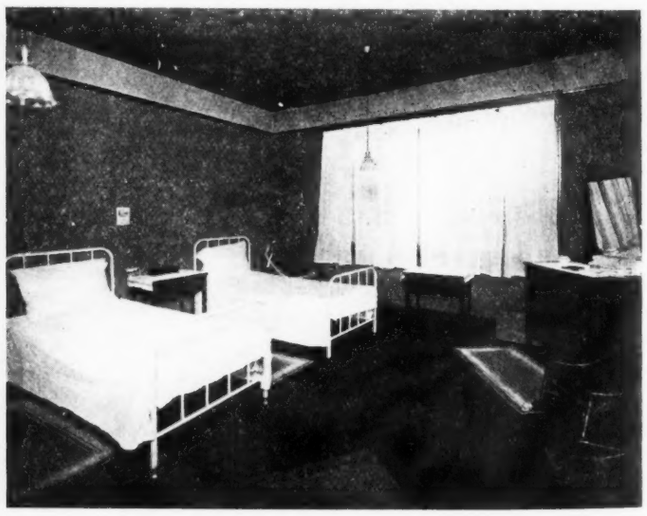
The responsibility of supervision over the rest room in the case of the Goodrich company is delegated to certain com-

From this view of one of the rest rooms maintained at the plant of the B. F. Goodrich Co. it is apparent that the company believes that welfare work well done pays well

The Goodrich Co. started its hotel for women employees when the problem of caring for workers who came to the plant from other centers became acute



One of the several living rooms each of which is equipped with piano. Visitors are entertained in these rooms



One of the double rooms in the Goodrich hotel for women. The charge for a room like this is $1.50 per week per girl

petent young women employees who arrange their lunch hours so that they may spend regular lunch time in a supervisory capacity in the rest room. No definite schedule of regulations has been drawn up aside from the general stipulation that in order to retire to the rest room at other than the regular lunch period, it is necessary for a girl to secure the permission of a designated forelady in her department.

The rest rooms in the Goodrich plant are located in the various factory buildings at convenient points.

A group of buildings formerly occupied by a church organization was taken over by the company and converted into something approaching a hotel. One of the buildings was used as a dining room and gymnasium and the other buildings were fitted up as sleeping rooms giving a total of 80 rooms which will accommodate 165 girls.

Girls working at the Goodrich plant may live at this hotel and are charged $1.50 to $1.75 each for double rooms and $2.25 per week for the single rooms. They are allowed 16 meals per week for $4.50, these meals including breakfast and evening dinner on the first five days of the week and three meals each on Saturdays and Sundays. The total cost for room and board is, therefore, between $6 and $6.75 for each girl and this is said to be much cheaper than accommodations could be obtained anywhere near the plant.

The double rooms, one of which is shown in a photograph herewith, are fitted with twin beds, a dresser, wardrobe, chiffonier and several chairs. A few larger rooms accommodate three girls, but a much greater number are single rooms which are fitted out in a similar manner.

On each floor are ample bath and toilet facilities. In the basement is a completely appointed laundry where the girls may have the use of tubs and electric irons.

The dining room is run on the cafeteria plan and a special point is made to serve only the very best of simple foods.

Prospects for Tractor Sales in Australia

IN the course of time, Australia will prove one of the most attractive fields for the sale of American tractors, in the opinion of Juan Homs, a special agent of the Department of Commerce, who is the author of Bulletin No. 166 of that Department, on Agricultural Implements and Machinery in Australia and New Zealand.

The introduction of farm tractors in Australia has been accompanied by the same vicissitudes that marked the early sale of these machines in the United States and elsewhere. Several years ago, when tractors began to receive marked attention in this country, they were imported into Australia in some numbers. It was found, however, that the purchasers were, as a rule, not prepared or equipped to make a success of their operation. More than to any fault of the machines themselves, their failure must be attributed to the inadequate manner in which they were sold and put in the hands of the purchasers. This was, at least in part, due to the lack of provision made by manufacturers and importers for properly informing the owners with regard to the handling of the machines, and to the inadequate consideration given to the fundamental principles that should have been observed in placing machinery of an unknown type in the hands of the farmers. Most of the machines imported into the Commonwealth during what may be termed the "first period" in the development of the tractor business remain to-day as significant evidence not so much of their unworthiness as of the hasty and ill-advised methods that governed the first attempts to introduce them. This is to be sincerely regretted, for the advent of the smaller, more serviceable, simpler, and better tractor of to-day, with the enormous possibilities that are apparently open to it in Australia, is not so favorably received there on account of the injudicious policy in the past. Notwithstanding the favorable conditions existing in Australia for the tractors made to-day, their popularization will prove relatively difficult. The bitter lesson, learned alike by manufacturers, importers, and users, will not have been in vain, however, if it teaches more progressive, fundamental, and business-like methods in the introduction and sale of tractors such as American factories are turning out at the present time.

One of the Most Attractive Fields

Time will undoubtedly confirm the opinion of many observers that Australia is one of the most attractive fields for the sale of American tractors. Nearly every condition is present to warrant such expectations. The extensive character of wheat growing is in itself a factor of great importance in this connection, for it can be safely said that more than 80 per cent of the cultivated area of Australia will probably prove economically adapted for their use. The methods of wheat growing in vogue in that country will enable the growers to perform all the necessary operations with one tractor—to the point that horseless farms may become a reality there.

It would be not only useless, but prejudicial and unfair to more progressive manufacturers as well, for any tractor maker to endeavor to market his product in Australia while leaving the entire burden of introduction upon the shoulders of the importer. Such a policy would be extremely harmful, so far as that country is concerned, to the future of the American tractor industry, which has raised such high hopes and holds such bright promise. There is danger that the confidence of the manufacturers in their own machines, based on an intimate knowledge of their construction, may obscure their realization of the fact that their machines at first will be entirely unknown and will constitute a very perplexing problem to foreign importers and users. It is very important, therefore, that they should be warned of this (even though, in certain cases, such caution may not be necessary), and that they should be prepared to instruct their foreign agents carefully during the introductory period. In most cases this will be impracticable unless competent men from the factories are sent wherever the machines are introduced, to remain for a reasonable length of time, with the object of instructing the agents concerning every phase of the tractors' work, and operation, so as to insure the complete satisfaction of the ultimate buyer. To neglect doing this will prove disastrous to all concerned, and will render futile the hope of building up a permanent, substantial, and growing demand.

In spite of the adverse conditions brought about by the war (chiefly those having to do with the high cost and scarcity of cargo space), a rather large number of small-sized American tractors have been sold in Australia during the past three years. It is felt, however, that the difficulties likely to be met as long as present conditions continue will render inadvisable any great exertions for the time being, but it is to be hoped that as soon as such conditions disappear American manufacturers will look upon the Australian market as one worthy of their very best thought and attention.

Smaller Sizes Suit Demand Best

Tractors of from 12 to 20 drawbar horsepower will probably prove the most popular and the best adapted to Australian requirements so far as size is concerned, although the country also offers good scope for the sale of a considerable number of larger machines. Quality will generally be a more important consideration, with most buyers, than low price, although it is not unlikely that at first low-priced machines will have a good run. The ultimate results, however, will undoubtedly justify the greater efforts that may be necessary to introduce an improved type of farm machinery, which in the long run has always proved to be preferred by Australian agriculturists. On account of the sandy character of the soil in many of the wheat-growing districts of Australia, machines possessing any special advantages when working upon such soils will probably be in greater demand than those that may prove unsatisfactory under such conditions. There seems to be a tendency in Australia to agree that machines with tracks will prove more acceptable than round-wheel tractors, but round-wheel machines will not be discriminated against if they prove capable of doing satisfactory work upon light sandy and wet soils. It will be well for American manufacturers to visualize the conditions under which tractors will work when operating machines of the stripper harvester type. Since only the wheat heads are taken off the crop the tractor will be called upon to travel over a heavy growth of straw, which will cause a good deal of slippage unless the wheels are fitted with suitable lugs. Machines that will successfully burn kerosene will also be preferred, although the difference between the cost of kerosene and gasoline in Australia is not so marked as in the United States.

Best Class of Dealers

It is difficult at this stage to indicate what class of firms in Australia will be best equipped to handle the tractor trade. The firms interested in the sale of agricultural machinery are generally very progressive, and in most cases they may prove quite capable of handling farm tractors. On the other hand, the firms engaged in the sale of motor cars, a good many of which also sell gas engines and other classes of machinery, might prove to be at least as well equipped to take up this business. Owing to the long terms that it will probably be necessary to give in the sale of tractors, the manufacturer should be satisfied concernnig the financial resources of any intending agent and importer before giving him the agency. There appears to be every reason to believe that a group of gas-engine and tractor manufacturers could get together and successfully establish branch houses for the sole object of selling this class of goods.

Three or four Australian manufacturers have taken up the construction of farm tractors, and one of them has already succeeded in turning them out in fairly large numbers. One of the few discouraging features in this connection is that a duty of 30 per cent is paid upon imported tractors.

A Mechanism for Changing Gears Automatically

Relieves the Driver of the Drudgery of Gear Shifting and Prevents Injury to Gear Teeth by Shifting While Clutch Is Imperfectly Released—Gears Shifted and Clutch Operated by Engine Power

AN interesting design of automatic gearshift has been evolved by Louis Biava of 235 Central Avenue, West Hoboken, N. J. It is adapted for use on passenger cars, motor trucks and similar vehicles, and a model of the device has been applied by Mr. Biava to a Pierce-Arrow truck.

We have had in the past several types of semi-automatic gearshifts in which the operator works a selector and the shifting of gears is effected automatically when he throws out the clutch; also at least one type of automatic gearshift in which the control factor is the torque on the propeller shaft. Mr. Biava's device is similar to the latter in that it is completely automatic, but in its case the controlling factor is the engine speed.

The power required to shift the gears is derived from the engine and is transmitted through a screw shaft *A* which is driven from the engine camshaft and has right and left-hand square screw threads cut upon it at opposite ends, each thread occupying one half of the effective length of the screw. Upon each end of the screw shaft there is a correspondingly threaded sleeve *B* and the two sleeves are mechanically connected together by a differential gear *C*, comprising bevel gears cut on the adjacent faces of the two threaded sleeves *B*, a ring or spider riding on the outside of the threaded shaft and a set of bevel pinions on same, meshing with the two bevel gears.

Threaded Shaft Shifts Gears

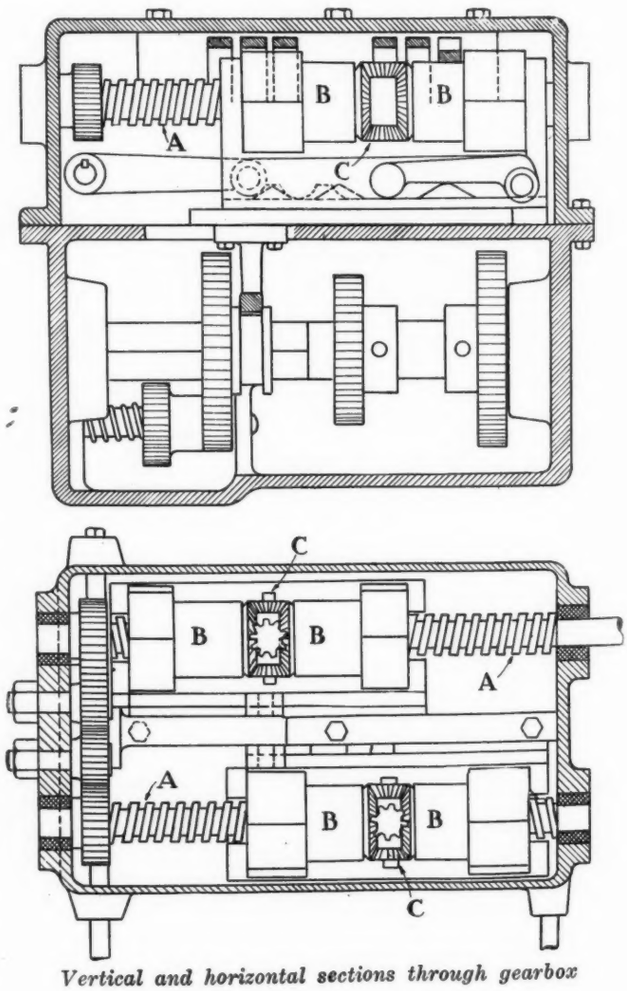
Ordinarily as the threaded shaft revolves—that is, as long as the engine is running—and there is nothing to hold the sleeves upon it from revolving, these latter turn idly with the shaft. But when one of the sleeves is held from rotating, it is naturally moved along the shaft by the screw threads. This compels the other sleeve, which is oppositely threaded, to turn at twice the speed of the shaft in order that it may move along the shaft at the same speed, and the differential connection between the two shafts permits it to do this. A shifting yoke *E* spans the screw shaft at each end of the sleeves. It acts through the intermediary of two coiled springs *FF* on a sliding bar *G* to which the gear shifter forks *HH* are connected.

Holding one of the threaded sleeves from rotation moves the sleeves and the sliding gear set connected thereto in one direction, and holding the other sleeve of the set moves the gearset in the opposite direction. As in a three speed and reverse gear, there are always two sliding gearsets, two threaded shafts and two sets of sleeves therefor are required.

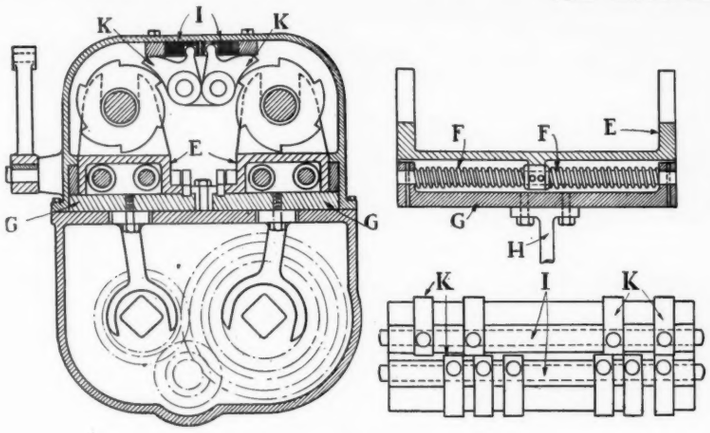
A description of the means employed for holding one or the other of the threaded sleeves from rotation is next in order.

The element which furnishes the effort required to hold one of the sleeves from rotating is a centrifugal governor connected to the engine. This governor, shown in one of the illustrations, acts on a cam rod *I*, that is, a rod or bar having a cam groove cut in its surface. In this cam groove is lodged the ball-shaped end of one arm of a bell crank *K*, the other arm of which forms a pawl adapter to engage with ratchet teeth on the threaded sleeve *B*. In certain positions of the cam rod *I*, the pawl is free of the ratchet wheel, while in other positions of the rod it is engaged with the ratchet.

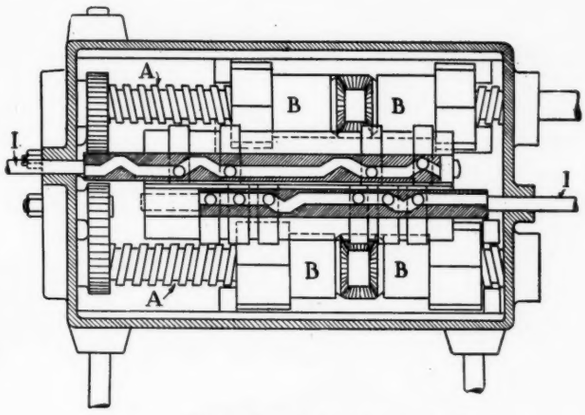
The clutch is automatically released by the gear shifting mechanism, and one advantage of the automatic shift over hand-shifting is that with the former it is absolutely impossible for the clutch to be engaged when the gears are being enmeshed, which sometimes occurs with



Vertical and horizontal sections through gearbox



Details of shifting mechanism



View showing the cam rods

hand shifting and is very destructive of gear teeth. The shifting yokes *E*—which span the threaded sleeves—are provided with cam lobes and form a face cam acting on the clutch lever. When the free end of the clutch lever rests on top of a cam lobe the clutch is released; when it rests in a depression between cam lobes the clutch is engaged, engagement, of course, being effected automatically by the clutch spring. The depressions between cam lobes correspond to the positions of full mesh of the different sets of gears. When the gears are in neutral the free end of the clutch lever is always on top of a cam lobe and the clutch is released.

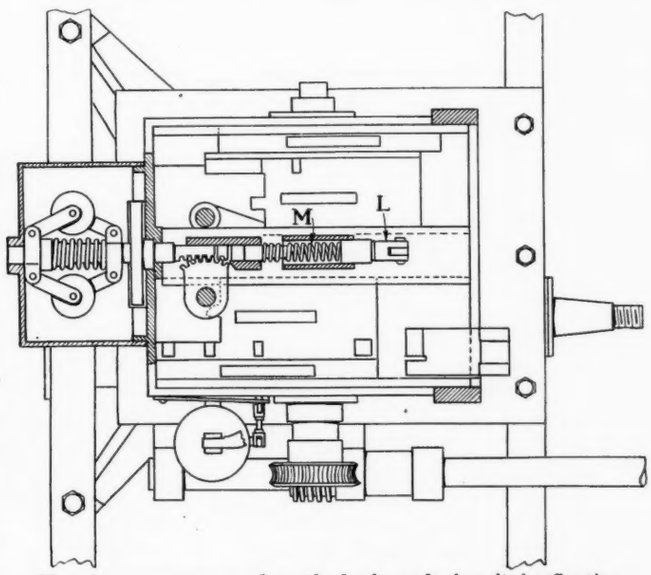
The same sliding yoke which carries the cams for releasing the clutch also carries a cam—for applying the service brake.

The action of the mechanism is as follows: When the engine is at rest the clutch is disengaged and the gears are in neutral position. By means of the throttle lever on the steering wheel, the gears may be set either for the low speed forward or for the reverse position. This setting is accomplished by the same movement of the lever which partly opens the throttle valve for starting the engine. The throttle lever moves over a semi-circular quadrant which is divided by a stop into two unequal parts. A knob on the lever has to be pulled in order to permit it to pass by this stop. If the lever is at the stop, the throttle valve is virtually closed and the gear is in neutral position. When the lever is moved to the right from the stop, where it has the greatest range of motion, the transmission will be set for first gear forward, and when it is moved to the left of the stop the transmission is set for reverse. The actual meshing of the gears is effected by engine power when the engine is started up.

Supposing the throttle lever to be moved in the direction corresponding to forward motion. As soon as the engine picks up, the low speed set of gears will be shifted into mesh, and as soon as they are fully enmeshed the clutch will be automatically engaged and the car will start off. If the driver wants to continue on first gear for a while, as may sometimes be the case in traffic, all he has to do is to so manipulate his throttle valve that the engine will not run beyond a certain moderate speed. Otherwise, he opens up his throttle and as the engine speeds up the gear shifts automatically to second and finally to third. If the car comes to a hill and the speed in consequence decreases, the gear automatically shifts back to second speed, and, if necessary in order to keep the engine running at a fair speed, to first gear.

On the other hand, if the driver wants to drive slowly on high gear, he will, of course, close his throttle valve. This causes the engine to slow down and the governor balls tend to approach their axis of rotation and in consequence shift the gears from third to second and finally to first. To prevent this a foot button is provided which when pressed upon, through the intermediary of a linkage *L* and a spring *M*, exerts pressure on the governor sleeve opposite in direction to that of the regular governor spring, keeping the governor balls separated and the gear in high or in second as desired.

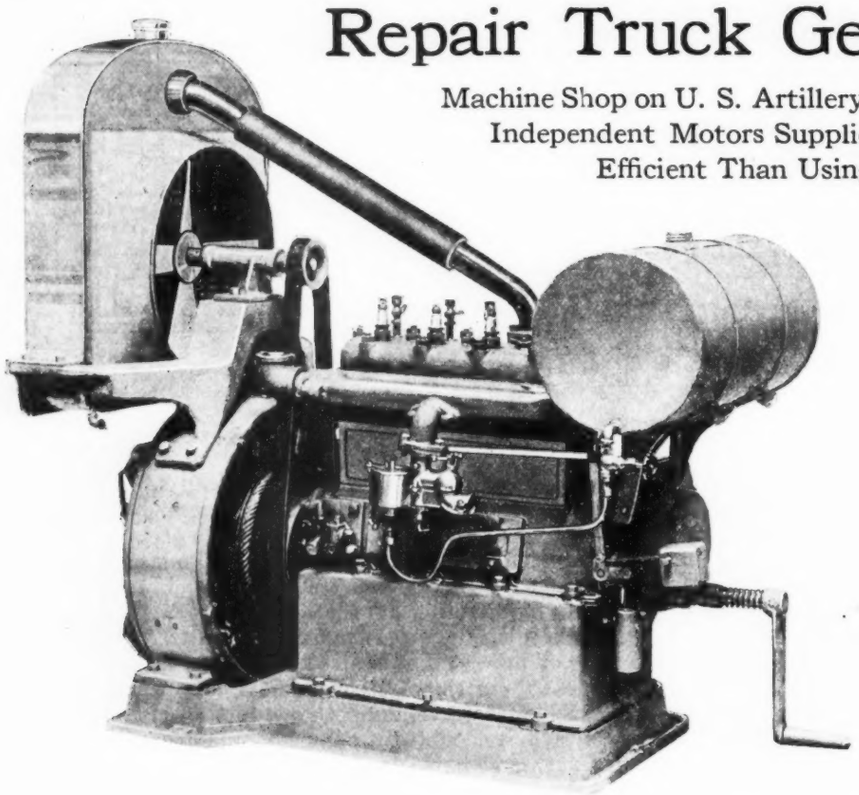
In describing this system we have only touched upon its principal features and not gone into all of the details. The system undoubtedly offers some important advantages, such as eliminating the need of manual gear shifting and preventing injury to gears by shifting while the clutch is still engaged. Whether these advantages are sufficient to warrant the complication which it involves cannot be decided offhand. At first one is likely to be prejudiced against any piece of complicated mechanism, but it must be remembered that when properly standardized and made in large numbers such mechanisms may not only be produced quite cheaply but at the same time may be very reliable. Undoubtedly a number of points would require further development, and one condition of operation that does not seem to have received sufficient consideration is when descending a long hill and using the engine as a brake, with a low gear in mesh, when in spite of heavy throttling, the engine might conceivably attain sufficient speed to change to second and third speed. This problem, however, could readily be solved.



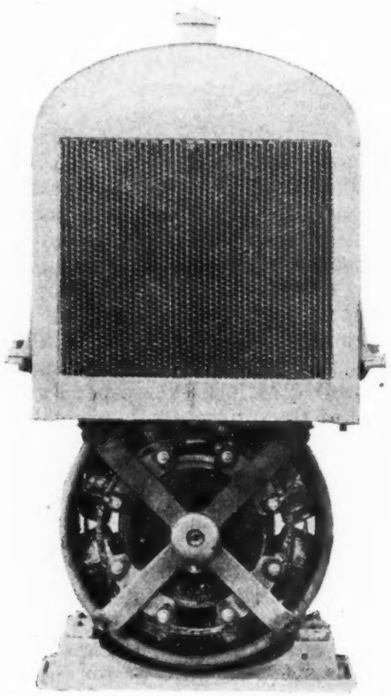
Showing governor and method of rendering it ineffective

Repair Truck Generating Unit

Machine Shop on U. S. Artillery Repair Truck Operated by Independent Motors Supplied by Generator—More Efficient Than Using Truck Engine



Left side of engine-generator set, showing carbureter and connections, also mounting of radiator and oil pump



Radiator end of engine-generator set

AN interesting installation for generating electric power is used on the artillery repair trucks built for the Ordnance Department by the American Car & Foundry Co., in Berwick, Pa. The artillery repair truck is fitted with a lathe, drill press, air compressor set and a number of other machines, each operated by an independent electric motor. In order to supply the current for these independent motors there is a generator set operated by a four-cylinder four-cycle gasoline engine direct connected to a dynamo. This is made by the Universal Motor Co., Oshkosh, Wis.

A set of this kind is compact enough to be mounted upon the body of this repair truck and at the same time supplies sufficient electrical energy (4 kw.) to operate the machines and to give an adequate lighting system for the trucks. It is an easy step from the supplying of current for purposes of this kind to similar purposes on the farm or at any point where a central electric supply system can be utilized. The entire set is so compact that it takes up but a few square feet of floor space. The gasoline tank, radiator engine, and dynamo are so compactly mounted that they are readily carried upon one cast base, which could be placed on any firm foundation and supply current enough to take care of the average farm.

Self-Contained Unit

The entire unit is self-contained and comprises an engine direct connected to a generator. The armature of the generator acts as the flywheel of the engine. In connection with these two main components there is a radiator and a 5 gal. gasoline tank with the necessary piping. There is also a switchboard which can be mounted at any convenient point.

Since the generator is direct connected, the speed of the armature is the same as that of the crankshaft and the engine governor acts as a regulator. This governor is a throttle type and can be set to any required speed. The normal speed of this particular engine is 1100 r.p.m., at which speed the engine develops 8 hp.

The engine is a four-cylinder unit with the cylinder block cast. It has a bore and stroke of 2⅝ by 4 in. The manifolds are cast integrally with the cylinders and the cylinder head is detachable. Gray iron pistons are used, with three piston rings, all of which are above the piston pins. The pistons have a clearance of 0.003 in. and below the lowest ring are drilled to furnish an oil return passage for the lubricant scraped off the cylinder walls by the piston rings. The piston pin is hollow, hardened and ground. It operates within a bronze bushing contained in the upper end of the connecting-rod. The connecting-rod is a drop forging of I-beam section. At the lower end it contains a die cast babbitt bearing for the crank pin.

Steel Drop-Forged Crankshaft

The crankshaft is a steel drop forging 1½ in. in diameter. It is direct connected at one end with the armature of the generator which acts as the flywheel, and at the other extremity it terminates in a squared end to take the starting crank engagement. The crankcase and engine bed are bolted together by flange connections and the bed is so shaped as to support the frame of the generator containing the stationary fields and to provide a substantial base within which the unit can be bolted to any firm foundation.

The radiator is an automobile type with a shield to secure the maximum draft of the fan. It is mounted on a frame bolted to the generator casing. The gasoline tank is supported on a bracket by the crankcase of the engine at the starting crank end.

The oiling system is automatic, oiling being taken care of by a removable plunger oil pump. The plunger is actuated by an eccentric on the camshaft. The suction pipe has a fine gauze cap to prevent dirt working up into the pump, and this is inspected by removing the oil pump. The oil is carried to a sight feed device located over the gear case, where the oil flows over the gears and down to the drip pan below the connecting-rod and then finally into the reservoir below. The splash from the connecting-rods lubricates the interior bear-

ings and a form of piston is used to prevent excessive oil from working into the combustion chamber. The surplus oil is scraped down by the lower ring, flowing back through the holes below the lower ring to the crankcase.

The oil sight feed device is composed of a large glass body so that the working of the oil can be seen at a distance from the units.

Cooling is by thermo-syphon, the flow being upward through the straight water pipe connection between the cylinder head and the top of the radiator.

Gasoline is fed by a gravity from the 5 gal. cylindrical tank mounted on the rear end of the engine. The carbureter is a float feed type, with an auxiliary air valve, and the entire gasoline system is readily accessible for cleaning, since the piping and the tank connections are all exposed.

Ignition is provided by a Bosch high tension magneto on the Government installation, although this ignition may be varied for commercial or industrial purposes. The generator is compound wound. It is of 4-kw. or 4000 watts capacity and operates at 110 volts. Regulation of the current output is secured by means of a governor which is of the centrifugal type mounted in an oil tight casing with an accessible cover. In this location it receives oil automatically from the gear case. The following is a list of the general specifications of the engine-generator set used on the artillery repair trucks:

Type of Engine, Four Cycle	Crankshaft Diameter, 1½ in.
Number of Cylinders, Four	Crank Pin Diameter, 1½ in.
Cylinder Diameter, bore, 2⅝ in.	Crank Pin Length, 1¾ in.
Stroke, 4 in.	Cylinder Head, Detachable
Brake hp., 8 at 1100 r.p.m.	Ignition, Bosch Magneto
Cylinders Cast, in Block	Fuel Feed, Gravity
Cylinder Material, Gray Iron	Governor, Centrifugal Type
Piston Material, Gray Iron	Lubrication, Circulating Splash
Piston Clearance, .003 in.	Cooling, Thermo Syphon
Number of Piston Rings, 3 per piston.	Gasoline Tank Capacity, 5 gal.
Connecting Rod, I-Beam Forging	Generator, Multiple Pole Type
Piston Pin Bushing, Bronze	Voltage, 110
Lower Rod Bearing, Die Cast Babbitt	Winding, Compound
Crankshaft, Drop Forge Steel	Voltage, 110
	Capacity, 4 kw.
	Switch Board Size, 14 x 24 in.

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Wages and Hours of Labor

MUCH sound industrial philosophy is to be found in the report of the Railway Wage Commission which has just been printed in full in the monthly review of the Bureau of Labor Statistics. An unusual amount of space is devoted to abstract discussions of fundamentals in industrial relations. This is particularly true of the parts of the report devoted to hours of labor and rate of payment for overtime work. What is said there is of interest to all manufacturers.

"The matter of hours of service," says the report, "is lodged deep in labor's mind. A standard day of reasonably limited length is as much a part of the measure of justice with the workingman as is his rate of wage."

"Slowly and steadily, by force of law somewhat, but also by the voluntary act of the employers, a shorter workday is being put into effect. This tendency will continue, and the shorter day will come to be regarded, not as a means of minimizing the returns which the worker gains, but as a conserver of the human material upon which industry rests. This matter of work time must be submitted to the pragmatic test. Society will come to see that there is a maximum which is beyond the Plimsoll mark of wisdom, and a minimum that makes society in many ways the sufferer. The line of moderation, the medial line, is one that must be proved by experience. The wise employer will look with sympathetic eye to find it, and the wise employee will attempt in good faith to make it manifest. It would be a splendid achievement if we could at this time crystallize the experience of the world into a conclusion concerning the length of the workday that would be of universal application. But this is not possible now for many reasons, not the least of which is an insufficiency of data touching so many and such diverse employments which call for such differing strains upon human nerves and muscles.

Overtime Rates

"Closely allied to the matter of hours of service is that of extra pay for overtime. In fact, the whole theory of those who speak for labor is that extra pay for overtime is the logical way to force the standard day of reasonable hours, with no work thereafter. In that theory there may or may not be force; but, quite apart from such view, certain it is that in harmony with the broader idea that fair hours of rest and recreation are the laborer's right, the use of those hours in industry may well be obtained only at a wage much above the normal. With overtime as with hours of service, however, the commission believes that the existing rules and conditions of payment should not be disturbed during the period of the war. But at the time when the study of the matter of hours of service is made, that study must sympathetically cover also the broad and kindred field of compensation for the overtime which is necessary in certain classes of service."

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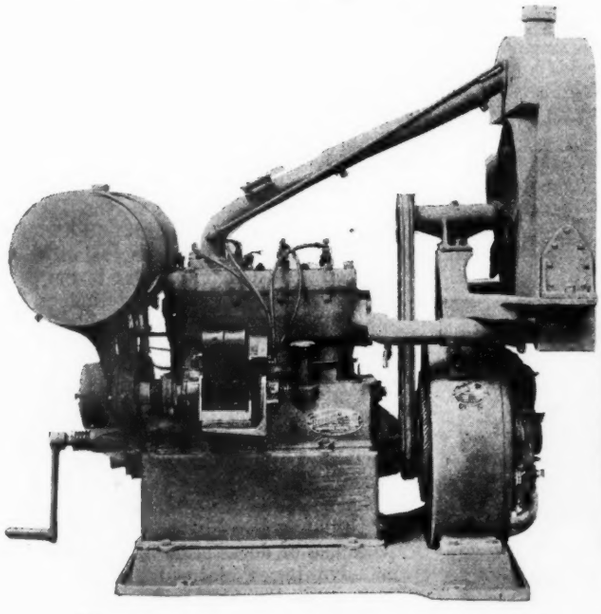
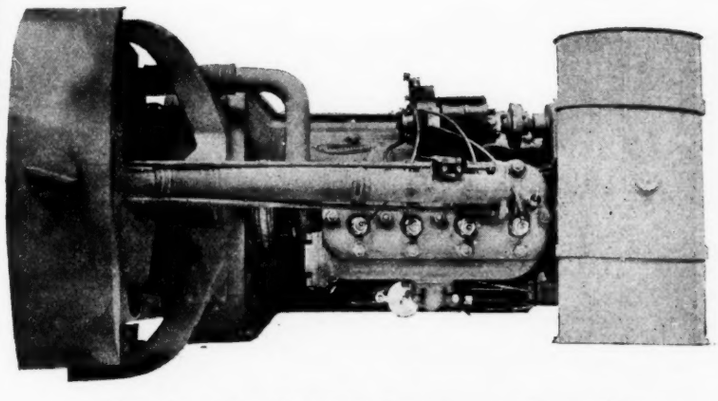
UNTIL now the English Government has permitted the payment of fees due in enemy countries in connection with the grant, registration and renewal of patents, designs and trade-marks, and also the payment in Great Britain and allied territory, for the account of enemies, of similar fees. It has now been decided to revoke all licenses for the payment of such fees. The reason for this step is said to have been the general public disapproval of the practice of maintaining relations with the enemy.



View of engine-generator set on magneto side, showing water connections to radiator

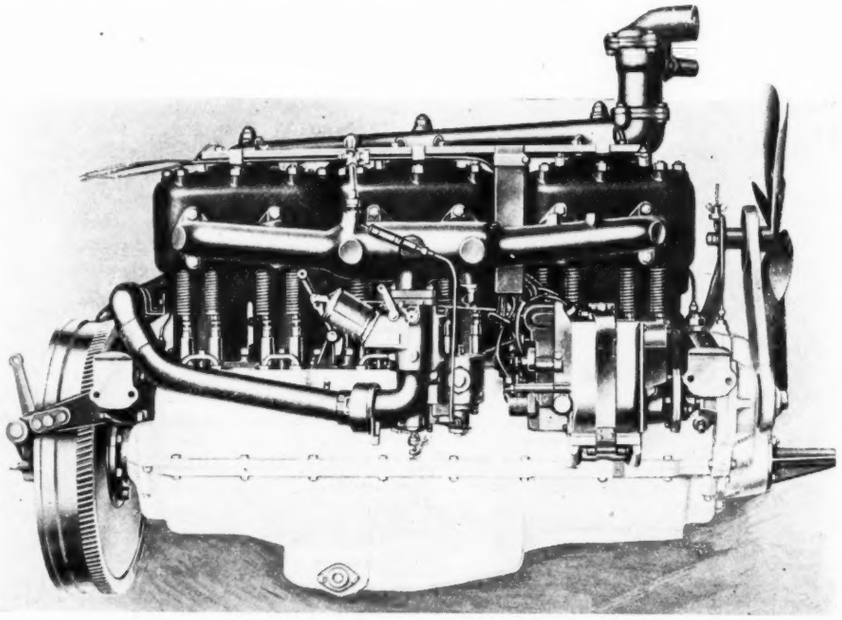


Plan view of engine-generator set as used on ordnance artillery repair trucks

Pierce-Arrow Adopts Dual Valves

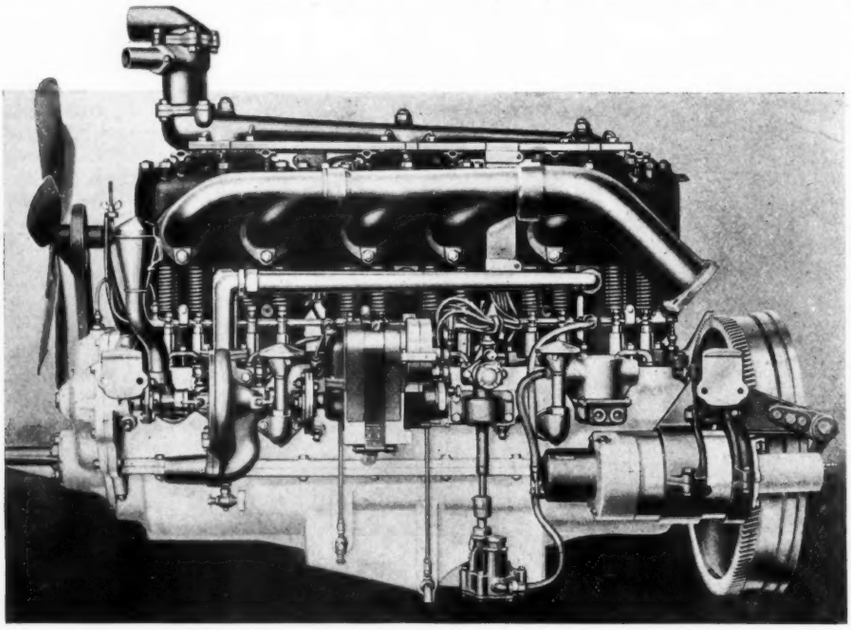
In New Series Five Cars, T-Head Cylinders with Detachable Heads and Two Intake and Two Exhaust Valves Per Cylinder Are Used—Hill Climbing and Accelerating Ability Greatly Increased

IN engines having individual cylinders of considerable displacement, the provision of two inlet and two exhaust valves per cylinder tends to give increased output and flexibility of operation. In racing engines and aircraft engines dual valves have been used for many years. They have also come into use on stock passenger cars of the four-cylinder type, the chief object sought being to give these four cylinder cars the same range of high gear operation as six-cylinder machines. Now the Pierce-Arrow Motor Car Co., Buffalo, N. Y., has adopted the dual valve principle in its new six-cylinder model. Under the old system of terminology, the car would have been referred to as a 24-valve design, but the Pierce company prefers the more descriptive term "dual valve six."



Inlet side of Pierce-Arrow dual valve engine

In the experience of the Pierce company, the demand of the buying public to-day is for better high gear performance. To meet this demand in their 48 hp. model, the company built various types of six, eight and twelve-cylinder engines, and as a result of these experiments, they are now more than ever convinced that a six-cylinder engine is the preferable type for passenger vehicles. It was found that the greater power developed in some of the newly designed engines, especially at the higher speeds, was due almost entirely to the large size of the valves employed in proportion to the cylinder displacement volume, thus insuring a high volumetric efficiency. In order to obtain as great valve capacity in the six-cylinder, 4½ x 5½ in. engine with which its 48 hp. model has been equipped, as found in some of these high speed engines, it would have been necessary to use 3 in. valves with a ⅜ in. lift. With a greater lift, of course, a smaller diameter valve would have sufficed, but it was figured that ⅜ in. was the maximum lift which would permit of reasonably quiet valve action. This size of valve, however, is prohibitive, because of the noise due to the heavy springs required to close them promptly, and also on account of the tendency of the valve heads to warp out of shape. In standard practice, it is seldom that a clear diameter of valve of more than half the cylinder bore is used. For a 4½ in. bore cylinder, this gives a 2¼ in. valve, which is substantially what the Pierce company has been using on its 48 hp. engine in the past. The conclusion was therefore reached that in order to get the maximum power out of the cylinders, it would be necessary to use double inlet and double exhaust valves. The valves used have a clear diameter of 1½ in., with a ⅜ in. lift, thus giving the same opening area as the single valve of 3 in. diameter with ⅜ in. lift.



Exhaust side of Pierce-Arrow dual valve engine

The T-head cylinder construction, which has been championed by the Pierce company for so many years, is still retained, but with dual valves it became necessary to make use of detachable heads. Among other advantages claimed for the dual valve construction, aside from increased output from the same size of cylinders, are very quiet valve action due to the use of light valve springs, increased fuel

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economy and less frequent need for regrinding the valves. There is also said to be a remarkable improvement in the acceleration of the car on opening the throttle, the difference being apparent to the driver familiar with the 48-B-4 model.

The modified three-point support, which has been used by the Pierce company for years, is retained. Camshaft drive is by helical spur gears. Water circulation is effected by a centrifugal pump and engine lubrication by the pressure system, through oil passages drilled in the crankshaft. The oil pump is of the gear type.

A carbureter of the Pierce company's own make is fitted and is of the automatic type. Fuel is fed to the carbureter by the pressure system. Ignition is by a Bosch high-tension magneto with a Westinghouse battery system as a reserve. The two systems are independent and connect to separate sets of spark plugs. The timing of the spark is hand-controlled. The starting and lighting system is of Westinghouse make, comprising a separate generator and starting motor, and working on the 6-volt system. All wiring is on the ground return principle. The battery ignition distributer is mounted on the generator. Engagement of the starter drive is effected magnetically. Exide and the Willard batteries are carried.

From the engine the power is transmitted through a cone clutch to the four-speed and reverse selective sliding gear transmission, which is located amidships. The final drive is by spiral bevel gears, these giving a reduction of 3.53:1. The driving thrust is taken on the springs and the torque reaction on a torque arm. The axle is of the semi-floating type and is of the Pierce company's own make.

Wood wheels are standard equipment and are fitted with Goodrich Silvertown cord tires, 35 x 5 in. all around. The front springs are half elliptic and the rear springs three-quarter elliptic. The car has right hand drive and right hand control. Ball bearings are used in the gearset, ball and roller bearings in the rear axle and roller bearings in the front wheels.

The regular equipment includes a speedometer, shock absorbers, demountable rims, one-man top, clock, curtains, power tire pump and windshield. A choice of about twenty different body types is offered the purchaser. The price of the three-passenger roadster is $6,400 plus war tax, while the five-passenger and seven-passenger touring cars are priced at $6,500 plus war tax. All models have a 142-in. wheelbase.

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Market for Gas Engines in Australia

IMPORT statistics for the Australian commonwealth show a rather steady demand for gas engines in spite of war conditions. Thus the imports under this heading were valued at $850,825 in 1912, $936,427 in 1913, $897,314 in 1914-15 and $755,709 in 1915-16. The majority of these engines no doubt were small farm engines.

Referring to these figures in a recent publication of the Department of Commerce, Juan Homs states that no other farm machine has been so consistently in demand in Australia since the war started.

Every implement house and many other firms engaged in the sale of machinery other than agricultural, handle gas engines. In spite of this it is felt that any American manufacturer making the type of engines demanded in Australia will find that country a most promising and profitable field, worthy of his best efforts, if he attempts to specialize in the sale of such machines. The sending of special representatives, and even the establishment of branch houses, can be recommended for his consideration, for along certain lines Australia offers an almost virgin field for the sale of gas engines. It is generally believed, for instance, that several thousand engines to run the internal mechanisms of stripper harvesters and binders could be sold in Australia if adequate efforts were made to acquaint the farmers with the many advantages of these machines for that work. Owing to the extremely varied demand, it would be desirable in that case that a complete line of engines should be represented, and several manufacturers under such circumstances might be able profitably to combine and join their efforts in promoting a business solely concerned in the sale of gas engines.

Vertical and horizontal engines in sizes ranging from 1½ to 15 horsepower are sold, the heaviest demand being for 4 and 6 horsepower machines. Almost every kind of engine manufactured is sold in Australia, and while there seems to be a preference for high-grade machines a good many cheap engines are also sold. In the large sheep stations, for instance, where sometimes dozens of engines are used for pumping purposes, the question of price is often a consideration of moment and in some cases the cheapest engines are imported for that trade, although as more experience is had with them a tendency toward a better product is observed. Engines such as are ordinarily sold to farmers in the United States are in great demand for farm work, and these, on the whole, may be classed as the intermediate type, being medium or moderate priced machines.

The fuels used in gas engines in Australia can be said to be equivalent to those used in the United States. The cost of these in the former country is normally about double that in the latter, while during the past three years it has been about three times higher. The fuels used range from low-test kerosene to high-test gasoline, there being but little crude oil used in Australia in connection with the operation of gas engines.

The large number of engines imported from the United Kingdom indicates that substantial, heavy and well-constructed engines are in great demand, for it is well known that thus far English manufacturers have not taken up the construction of engines to meet the demand for low-priced machines. The demand for some of the better American engines, however, is rapidly increasing, and on the whole it is felt that Australia may be regarded as a very promising field for the sale of American gas engines.

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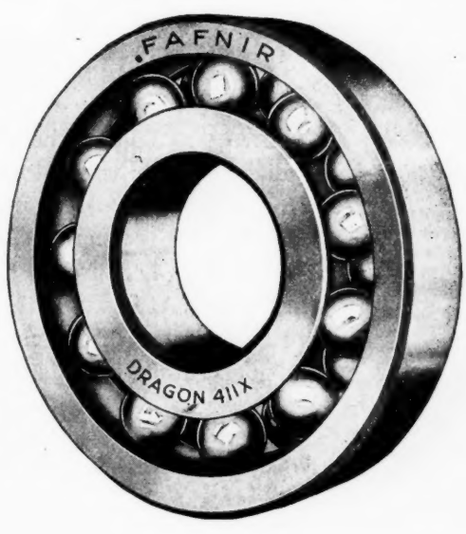
Double Row Fafnir Bearing

A DOUBLE row bearing in standard single row widths has been placed on the market by the Fafnir Bearing Company, New Britain, Conn. It will carry nearly twice the radial load of a single row bearing of the same size and, having an angular contact, it will carry an unusual amount of thrust load in both directions. This new bearing is believed to specially meet present conditions, as it is economical of both stock and labor. No retainer is required, as the balls are in staggered relation to each other. The axis of contact makes an angle of 20° with the plane of the bearing.

We understand that the experts of the Fafnir company invented a bearing of this type some five years ago, and a patent on it was immediately applied for. An interference developed, however, as another application covering substantially the same features had been made two years earlier. The Fafnir Bearing Company has now secured an exclusive license under the Mossig and Sachs patent, issued in 1915. The bearing described and illustrated herewith is to be known under the name of the Dragon type bearing No. 411X.



SIDE GUIDE & GRIPPER

England Prepares for

Business To-Day Is in American Sellers—Demand for

BY SPECIAL

JOHANNESBURG, Aug. 4—In the export market, what have the past 4 years wrought and what is the outlook? Speaking for South Africa, it has seen a great increase in American and Japanese business and now a depletion of stocks that will mean millions to be spent immediately conditions permit. While Africa has been giving her sons to fight on the Western Front she has been reaping a material return such as she has never experienced before. Wealth has come to the Union in so large an amount that it has given the necessary impetus long needed to every industry. War conditions are rapidly building up local manufactures, the farming community has benefited as never before, and our coal and iron trade has now become of first importance; in fact, the whole industrial outlook is changed and must now be reckoned with in any survey of the export field.

TO-DAY THE WHOLE automobile business is in the hands of the American manufacturer, but lack of shipping has handicapped it exceedingly. Time was when men, looking at our limited white population, argued that the sale of cars was being overdone, but now it is admitted that we are but in the infancy of the industry. It is a country of vast distances. Our railways touch only a fraction of the population, the necessity for quick intercommunication has become urgent and so the demand steadily increases. With growing wealth has come the increased demand for the better class of cars, but owing to the lack of freight the demand cannot be met, and to-day there is not an unsold high-class automobile in the whole country. What this really means can best be gaged by the fact that the Hudson Super-six sells at $3,750 and the Cadillac up to $5,500.

THE PAST 4 YEARS have also seen many changes in the trade, competition has become keener, old methods have had to give place to new, the firms that formerly led are being rapidly outdistanced and the personnel is almost entirely changed. New men have brought to the selling a vision and outlook that were impossible to the old dealer. For the manufacturer to-day to place his agency without a knowledge of these and other changes and to do so simply on the ground of a firm's financial standing or its successful past is to ignore the factors of vital importance. Change is so constant a feature of life here that the reasons which decided the placing of an agency in the past may have given place to conditions prejudicial to the manufacturers' best interests.

SERVICE IS TO-DAY the watchword of all successful business and nowhere has it been more recognized than in the automobile business of America. It is even of more value to a car's reputation in the export field and frequently it receives but scant attention. Hence arises the necessity for more direct supervision because dealers are frequently averse to carrying the necessary stocks of parts because of the capital involved. In fact the problem is an acute one in a country like South Africa, where the distance of the dealer from his source of supply is so great and where the number of towns with facilities for repairs are so few. More cars have had their reputations ruined on this market through want of attention to this than from any other cause.

South African Trade

Hands—Our Trucks Are Poor Kerosene Farm Tractor

CORRESPONDENT

FOR THE FIRST time since the opening of the war British automobile manufacturers are making time to pay attention to this territory. Old connections are being restored or new ones sought and there is every evidence that, so soon as conditions permit, the export market will be cultivated as never before. So far there is no evidence of any real attempt being made to compete in the lower-priced car, but in what is your $1,000 and upwards class the competition will be very keen indeed. The interest of dealers has been awakened and particularly so in cars such as the Crossley, the Arrol-Johnston and the Vauxhall. Previously neither of them could be said to have had anything but small sales, but now in the general opinion of the trade the first two are expected to pitch the note of British competition, especially the former. In the opinion of the writer, one of the first effects of this competition will be a decided reduction in the ratio of profits obtained by the dealer. Sentiment will undoubtedly play a considerable part in furthering their sale, but, on the other hand, many of the American cars will maintain their hold because of their flexibility, their quick response, their gasoline economy, together with the fact that our numerous hills can be negotiated without frequent change of gears.

ONE IMPORTANT and growing field has been left entirely to the British manufacturer, the light or baby car. It is a growing favorite in the towns as a runabout and, with the woman driver, it is much in demand, its extremely low gasoline consumption making it the most economical for short trips.

IT IS SINGULAR and one cannot account for it, but American motor trucks, above the light truck of 1 ton, have never had any appreciable sale in this country. This is all the more remarkable because, when war and our local rebellion broke out, the country was denuded of trucks by their being handed over to the military. Quite a number of American heavy trucks have been used in the German East African campaign and have given every satisfaction, but still our merchants and contractors seem to prefer to wait the advent of the British motor truck before again buying. In the light truck, of 1 or 1½ tons, there was the beginning of quite a considerable business, when shipping scarcity prevented their import. In this class the Maxwell especially has made a good showing and undoubtedly the future demand will be large.

GREAT INTEREST is being shown by agriculturists in the light kerosene farm tractor and a few samples have been imported, but the general verdict is that considerable improvements must be made before they are suitable for the work in South Africa. Our farmers look to them for the breaking of new ground, but so hard is the virgin soil here that, with one exception, none of them has come successfully through the test. Experts also seem to agree that the slow-revolution engine is better suited to our conditions and that the minimum of power must be about 30 hp. With our vast acreage still untilled, and with the increase in the number of our enlightened farmers, together with the high prices ruling for all farm products, few countries offer a better field for a suitable farm tractor.

Some Outstanding Problems in Aeronautics*

Part II

Engine Problems—Carbureters, Ignition and Lubrication—Variation of Power Output, Lift and Drift with Altitude

By Dr. W. F. Durand

WITH the problem of fuel, that of the prime mover, or engine, is closely related. Is the present type of engine to continue, or is it only a passing stage on the way to some more perfect form? This is a question, interesting indeed for speculation, but hardly to be considered in comparison with actual present moment problems. The present engine and its application to the propulsion of the aeroplane does, furthermore, present no lack of interesting and important problems, and among these a few of the more pressing may here be noted.

First, the problem of gross power. How much power can we put in an aeroplane or airship of no matter what type or form? This divides immediately into three subsidiary problems, as follows:

(1) How much power from a single cylinder?
(2) How many cylinders for a single engine?
(3) How many engines for a single airship?

In the way of power per cylinder we are now reaching close about 40 hp. as a maximum.

In the way of cylinders per engine we have reached a stage of development where the 12-cylinder engine is quite a standard type and higher numbers such as 16 and 18 represent only questions of detail. It is not too much to say that the 600-hp. engine is quite within the reach of present practice and may be realized as called for. We have long since become accustomed to two and three engines on a single plane and are now seeing four engines in various recent designs. It is therefore clear that if a power plant of 2500 hp. on a single structure is wanted, it is quite within the scope of present practice to realize and provide such a plant.

And if four engines of 500 or 600 hp. each, there is no reason why the number may not be increased, at least to a point beyond the present apparent need for power on a single strucutre.

On the other hand, it must be admitted that, having in view the limitations of present practice, the most simple and in fact the only reliable way of extending power is by a multiplication of the number of cylinders rather than by an increase in the size of the latter. The fact that a 2000-hp. equipment would presumably require from 40 to 60 cylinders shows the formidable degree of multiplication of small elements required to realize such a result. The real problem of size or capacity of engine is therefore one of power in a single cylinder. What can be expected in this direction, and in what way shall search be directed?

Cooling the Limiting Factor

The present limitation arises largely as a matter of cooling, and it is in this direction that search may well be made for ways and means of effectively increasing the power capacity of a single cylinder in an engine of the aviation type. This is a problem which is distinctly outstanding and well worth our serious attention and study.

Another problem connected with the engine is that of the carbureter. At the start of aeronautic engineering the carbureter naturally took its initial form and arrangement from the already fairly well developed automobile engine carbureter. This was but natural, since both engines are of the same type and both use the same general form of fuel. In respect of the conditions of operation, however, there is a marked and important difference. The automobile operates at or near a fixed level and hence in an atmospheric medium of sensibly fixed pressure and density. With the aeroplane the case is very different. The latter may change its level by thousands of feet in a few minutes or even seconds, as in vertical or nearly vertical dives, rapid spirals, etc. This difference in the conditions of operation introduces a factor of distinct significance and of great importance in the design and disposition of the carbureter. Experience in the air has clearly shown the importance of this new factor, and it is not too much to say that the problem of the entirely satisfactory carbureter, capable of automatically answering to the various atmospheric conditions under which it must work, is distinctly an outstanding problem. It is true that much progress has been made and as the result of laboratory research, checked by actual experience in the air, we now know much better than, say two years ago, the fundamental conditions which must be met by the carbureter for the aeronautic engine. The present solution can hardly be considered as final, however, and we may fairly admit that the whole problem of carburetion, including the manifold supply of the carbureted mixture to a multi-cylinder engine, should, as soon as may be, receive a thorough and fundamental re-study in the light of the information to be drawn from the experience of the past three or four years.

Ignition

Another problem which we should view as outstanding is that of ignition. It is true that ignition, as now realized with the best equipment, seems to be fairly reliable and effective. But the whole program is open to the objection of requiring an entire electric power plant of a highly specialized type, together with electric conductors and the spark plug for producing the spark between the discharge points within the cylinder. This ensemble, comprising electric generator or magneto, electric cable, distributer for sending the spark with proper timing to the various cylinders and spark plug with discharge points within the cylinder, represents a very complicated and highly specialized device for producing the initial ignition within the body of compressed fuel mixture. In its present state it is a marvel of scientific and technical development, and it does its work; but it is complicated and subject to many possible modes of derangement, and, as we all know, has been and is still the seat of some of the most serious of the engine difficulties to which the power plant as a whole is subject.

I have never been able to persuade myself that this exceedingly complicated and specialized auxiliary equipment was to be the final solution of the problem of producing ignition in an internal combustion engine. If we can anticipate

*Sixth Wilbur Wright lecture read before the Aeronautical Society of Great Britain at London, June 25.

the explosion engine of the year 1968, assuming that our grandchildren are still dependent on hydrocarbure fuels at that date (and furthermore that they are still available) it would seem as though some more direct and simple mode of initiating the combustion in the cylinders would have been found. Still, otherwise, we may say that on the law of probability, the chances are overwhelmingly against our having at the present moment developed the very best method of ignition. The laws of physics and chemistry, by a probability which almost reaches certainty, contain some potential combination of factors which will permit of eliminating much of the complexity and delicacy of adjustment which is so characteristic a feature of the present mode.

It is perhaps proper to add here that studies in this direction have already been made, and with results which offer promise of interesting developments in the future. The path of perfection is likely to be not a short one, however, and we can see no prospect of any development in the to-morrow of progress likely to displace electric ignition. There must, however, be some better way, and if not to-morrow, then some other morrow should see it made available for use.

The problem of ignition is then one which is distinctly outstanding, one which by its importance merits the most careful study, and one which, at least, offers reasonable ground for hope of a successful and relatively simple substitute for the present mode.

Maintenance of Power at Altitude

We come now to a problem of the very highest present and future importance, that of maintaining the power of the engine at high altitude.

The situation as it develops in the case of an aeroplane mounting to higher and higher levels in the atmosphere is readily appreciated with a moment's thought.

The power of the engine arises from the combustion of vaporized hydrocarbon fuel. The power per cycle for a given cylinder will therefore, to a first approximation and assuming a sensibly constant efficiency of thermodynamic transformation, vary directly with the weight of the fuel which can be burned per cycle. But this in turn depends upon and is conditioned by the amount of oxygen which can be drawn into the cylinder per intake stroke of the cycle. But the oxygen is brought in as one of the constituents of the atmosphere and hence the amount of oxygen available per intake stroke will depend upon and be directly proportioned to the amount of air which can be drawn in. But in terms of volume, just a cylinder full or, more exactly, just the volume represented by the piston displacement in moving from one end of the stroke to the other, can be brought in. Hence we may at least depend on what we may term a cylinder volume of air no matter where we are. But just here arises the trouble. The actual weight of air depends conjointly on the volume and on the density, and unfortunately for the aeronautic engine, at least, the density of the atmosphere decreases steadily with altitude, so that at 15,000 feet, for example, the density is only about 60 per cent of the normal density at the earth's surface. It is clear then that an aeronautic engine, other things equal, will draw in, per intake stroke, only about 60 per cent of the weight of air at this altitude as compared with the indraft at the earth's surface. Hence, it will be able to burn only 60 per cent of the fuel and hence with equal efficiency will develop only 60 per cent of the power.

But here we must stop for a moment and inquire as to the effect of such reduction of power on the speed of the aeroplane. We know that, other things equal, the resistance of an aeroplane to propulsion through the air at uniform speed varies directly with the density of the medium. Hence, at the same speed as near the surface of the earth and with the same altitude or angle of attack, the aeroplane at 15,000 ft. elevation would experience only 60 per cent. of the resistance and would hence require only 60 per cent of the thrust, and hence at constant revolutions of the propeller would require only 60 per cent of the power from the engine. Hence, it appears at first sight as though we had lost nothing in speed by the reduction of the power of the engine. If the latter has been reduced to 60 per cent of its amount at low levels, so has the resistance and power required so that the speed realized should remain the same.

Such would, indeed, be the case if this were all of the story; but, unfortunately, other considerations enter and the simple relation of uniform speed at varying altitudes cannot, as a matter of fact, be realized without compensating features.

Thus, if at a constant speed and constant angle of attack for the wings, the resistance to propulsion is only 60 per cent as great at the altitude of 15,000 ft. as on the ground, it is, unfortunately, the same for the lifting force developed by the wings. This also is only 60 per cent as great while the weight of the machine remains sensibly constant at all altitudes. Let us pause long enough to grasp clearly this fact, that while, at constant speed and attitude of flight, the resistance, the lift and all other aerodynamic forces involved vary directly with the density of the air, and hence decrease with the altitude, the weight of the machine, and hence the lift necessary for support, remain sensibly unchanged. Hence, at the same attitude of flight the lifting force at altitude and under the same speed will no longer support the plane, and unless something is done, it would be unable to maintain horizontal flight at such altitude.

Two courses are then open for consideration as follows:

(1) We may seek to increase the speed until at such increased value the lift will equal the weight of the plane. Under the conditions assumed, this would involve an increase of speed of about 30 per cent, thus increasing the resistance to propulsion by nearly 70 per cent or bringing it back to its value at low altitude. But this resistance overcome at the increased speed would mean an increase in the required horsepower of 30 per cent as compared with that normally developed at low level, while with the actual indraft of air and even allowing for the increased speed, only some 78 per cent of this, or 60 per cent of the needful amount would be developed. Hence, no such speed could be realized and the support of the unvarying weight in the rarefied air cannot be realized in this manner, and must be sought otherwise.

(2) Instead of seeking for the necessary lift by increased speed we may seek it by changing the angle of attack; by changing the flying attitude of the plane so that at the same speed, for example, the lifting force will be greatly increased. In this manner the needful lifting force may indeed be realized. But unfortunately with the increase in lifting force will come also an increase in head resistance, not proportionally, but still a definite increase. This will mean that the actual resistance at, say, 15,000 ft. elevation will be greater than 60 per cent of that at low elevation and hence with 60 per cent of the power available per cycle, the original number of revolutions cannot be maintained and a reduction in speed will result. With this reduction in speed will come a further loss in lifting effect and need for a further change in the angle of attack with increased head resistance; until finally, at some reduced speed, a condition will be found where the needful support for the weight of plane may be realized and the resistance to propulsion can be met by the thrust or pull developed at the propeller. Under these conditions, horizontal flight again becomes possible, but at a speed somewhat below that corresponding to low altitude conditions.

Loss of Engine and Propeller Efficiency

But this is not all of the story. In addition we must reckon on a diminished efficiency of the engine with decreased power, and with the probability of a loss in propeller efficiency with the resultant change in speed. Thus, if an engine is primarily designed to work at its best efficiency and under its best conditions at or near full atmospheric pressure and density, it will not work with equally good efficiency at high altitudes in rarefied air and when developing only about one-half the power for which it is primarily designed.

All of this means, in brief, then that at an altitude of say 15,000 ft. the plane must fly at a less advantageous angle of attack and hence with more resistance, and that the engine will be able to burn only about 60 per cent as much fuel and will transform the resulting heat less effectively than when at low altitudes. Hence, the power developed will be less than 60 per cent, and hence, insufficient to maintain the same speed; and with diminishing speed there may be further loss of efficiency in the propeller and a further loss of speed until finally matters become adjusted at some value usually definitely and sometimes considerably less than that corresponding to low level conditions.

Hence, as an over-all practical result an aeroplane normally loses horizontal speed as it ascends to higher altitudes.

Confronted with this fundamental fact, what is to be done? Such loss of speed, especially in a military sense, is or may become very serious, and one of the large and definitely outstanding problems in aeronautic engineering at the present time, centers about the possible ways and means of meeting this condition.

The obvious proximate solution is to avoid, so far as may be, the decrease in the amount of air handled per intake stroke of the piston as the plane ascends to higher altitudes.

Broadly, two courses are open. First, we may definitely and frankly design the plane and engine for a certain desired performance at a given altitude, say 15,000 or 20,000 ft. This is a straightforward problem in aeronautic engineering. Given the desired schedule of operation and the altitude, we can determine the resistance to be overcome and the horsepower required, and can design the engine accordingly. In such case the volume of the cylinders will be suited to the rarefied air in which the engine is to work and all proportions and details will be worked out on this basis.

It will be obvious that such an engine will have much too large a piston displacement volume when at low altitude. That is, it will be over size and over powered relative to the plane. In fact, operation near or on the ground under the same adjustments as at altitude would be quite out of the question. Means must therefore be provided for reproducing, when on the ground or at low altitudes, substantially the operating conditions at high altitudes and low air density; that is, the conditions for which the engine was designed. This may be most conveniently done by throttling down the air intake so that while air at or near full sea level density may surround the engine, it will be reduced in pressure at the intake throttle to such a degree that the amount actually taken into the cylinder will only equal that which would normally enter, without throttling, at high altitude.

Super Induction

On the other hand, we may definitely design the engine for operation at or near sea level and with size of cylinders and all proportions and adjustments worked out accordingly, and then by a supplementary device endeavor to maintain or to nearly maintain such conditions within the engine itself even if it is at high altitude and surrounded by air of a lower density.

This solution calls for some supplementary form of compressor or equivalent device which shall operate on the rarefied air as a first stage and raise it from the low pressure, characteristic of the altitude, up to or nearly to normal low altitude pressure and density.

Each of these alternatives represents a perfectly possible solution. Each has its special advantages and disadvantages. Each has its advocates as a solution of this important problem.

The first solution is the simpler of the two, since it involves no special or additional device for compressing the air. It does, however, mean extra weight in the engine which is always there and which will reduce correspondingly the net carrying capacity of the plane.

On the other hand, the compressing device of the second solution is not easy to realize satisfactorily and it also involves extra weight, though presumably less than in the case of the first solution. Again, its operation as a separate or independent unit for realizing a preliminary compression of the air is less efficient than to do the whole compression in the engine itself and by the engine piston as in the first solution. Only extended and careful trial will presumably be able to finally decide which is on the whole the better solution of the two.

The reserve necessary with regard to military matters makes it unwise to attempt to give any account on this occasion of just where the matter stands with regard to this problem, but it will at least be safe to note that it is a problem which is attracting much attention and study on the part of the various allied Governments, and that much valuable information is being developed, and on which we may hope that some satisfactory solution may be based.

(To be continued)

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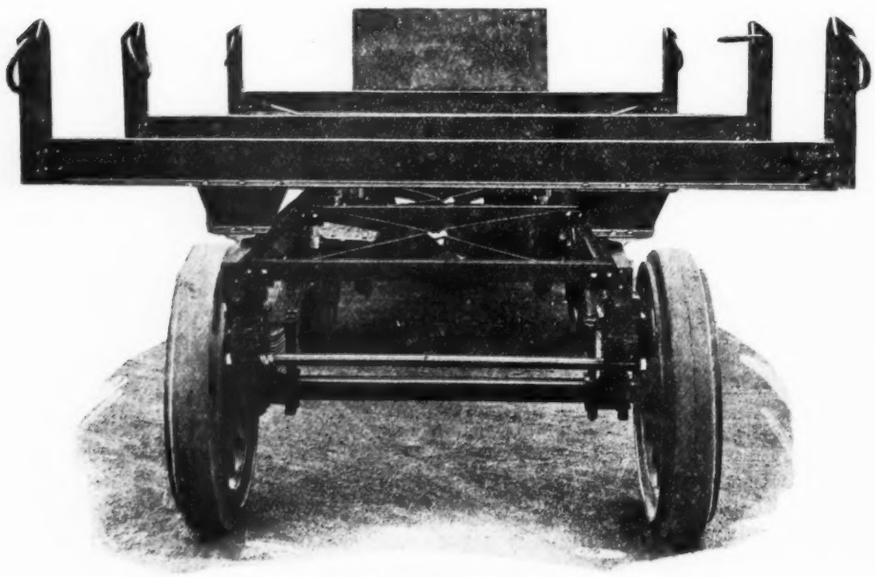
The Case Line of Trailers

A COMPLETE line of all-steel semi- and four-wheel trailers has been marketed by the J. M. Case Trailer Co., Grand Rapids, Mich. The line consists of models of 3, 4, 6 and 10 tons capacities, and extension pole trailers, and also incorporates something new in the way of a jacking device.

The pole trailers are built in three sizes, namely, 3½ ton, 4 ton and 6 ton. The latter two are of the extension type; when telescoped they give a wheelbase of 9 ft., and when fully extended, a wheelbase of 16½ ft. For hauling lumber, logs, poles and, in fact, any particularly long material, the pole trailer is the ideal equipment.

One important feature of this line of trailers is that any of the semi-trailers can be instantly converted into a four-wheel trailer by simply adding the Case front running gear. This front running gear unit is built in various sizes to correspond with the several semi-trailer capacities incorporated in the line. This unit consists of axle, springs, wheels, tires, drawbar and steel turntable, upon which rests the circle of the semi-trailer, the king pin of the semi-trailer being locked to the center of the turntable. The drawbar is equipped with a spring shock absorber so that the shocks and strains of starting and stopping are taken up.



Case 6-ton pole trailer

The company is also furnishing trailer chassis equipped with gravity steel dump bodies. These chassis are built entirely of structural steel channels of generous size. The other units include Timken roller bearings, Firestone tires, etc.

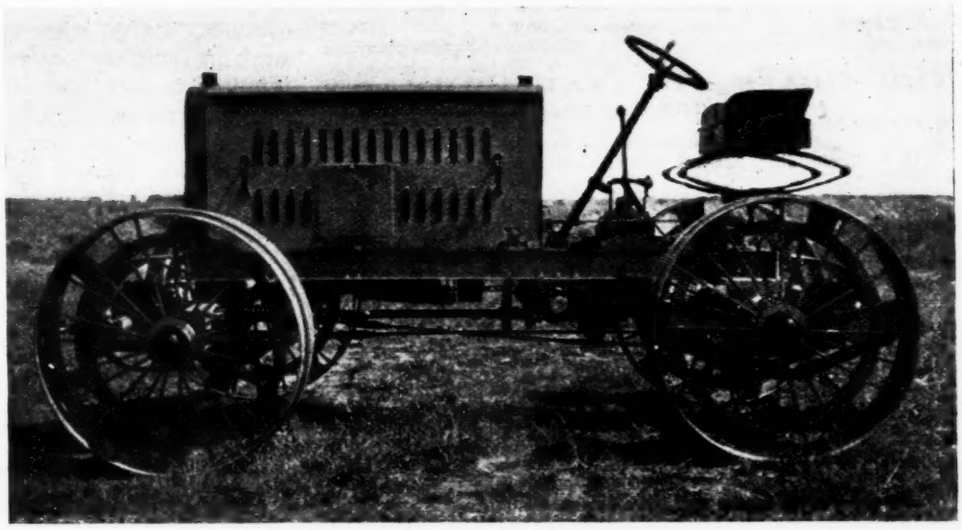
The new jacking device is of the double-post type and can be operated by one man from either side of the trailer. When not required the jack is swung up out of the way and as it is permanently attached to the trailer, it is always ready for service at a moment's notice.

J. M. Case, president, states that motor truck owners are fast coming to realize the importance of trailers and that the demand over the entire country is increasing.

Topp-Stewart Four-Wheel Drive Tractor

Principle of Four-Wheel Drive Permits of Light Weight—Tractor Designed for Road Haulage and Road Grading as Well as for Farm Work —Engine a Four-Cylinder Waukesha

THE war has brought the four-wheel drive principle to the fore in motor trucks, and Clintonville, Wis., is one of the centers, if not the center, of four-wheel drive activity. Having proven successful in motor truck work, and even essential in the work of the Ordnance Department, it is little wonder that the principle has been applied also in tractor construction. The advantage of the four-wheel drive is that all of the weight of the tractor, as well as that of the driver, is available for traction purposes. The weight of the tractor being equally divided between the four wheels, the tractor will not pack the soil as hard as would one having the bulk of the weight on its two drives. Simpler and less wasteful traction devices can evidently be used than where only about two-thirds of the weight is available for traction.



Side view of Topp-Stewart tractor with four-wheel drive

Traction is secured by means of loose sliding lugs that grip the ground and automatically clean themselves and the wheel. These are put on without the use of bolts, screws or nuts.

Designed for Road Grading

The engine of the Topp-Stewart is a Waukesha of 4¾ in. bore and 6¾ in. stroke, rated at 45 hp. It has a Kingston carbureter, an Eisemann magneto and a Perfex radiator. The change gear affords three forward speeds, viz. 1½, 2⅝ and 5 m.p.h. It appears that the tractor is intended for road work as well as for farm work, as mention is made of an instance where it pulled a heavy load up a steep grade when fitted with solid block tires. Road grading is one of the lines of work for which it is specially designed. The change gear is of the sliding pinion type and operates in oil.

The four-wheel drive naturally complicates the construction, but it is said to be applied here in the simplest possible form. Steering and control are arranged more nearly like on an automobile than on most other tractors.

Four-Wheel Steer

Ordinarily the Topp-Stewart steers on all four wheels, but it can be quickly changed to steer on two wheels only. A brake is provided acting on the main shaft and therefore retards all four road wheels. A belt pulley is furnished only on tractors intended for farm work. The pulley is 14 in. in diameter by 8 in. width of face and is controlled by a friction clutch. A special design of drawbar is provided which acts as a cushion spring both in starting and stopping. The belt pulley is located directly over the rear axle, between the frame and the rear wheel, on the right hand side of the driver. This is said to make it easy to line the tractor up with the machine to be operated and to tighten the belt.

The Topp-Stewart tractor weighs 6500 lb. and develops a drawbar pull of 4500 lb. on low gear, 4200 lb. on intermediate and 2000 lb. on high gear. Power steer, a power winch and a canopy are extra equipment that can be furnished.

The Lebby Searchlight

LEBBY ENGINEERING CO. of Charleston, S. C., which specializes in lighting systems for motor yachts, has developed a new design of searchlight for automobiles. In starting to work on the problem it did not plan to evolve some scheme of lenses to modify the angle of light, but to construct an entirely new lamp to secure certain definite results. The conclusion was reached that the first requisite was to produce a lamp which would throw a uniform beam of light on to the roadbed and limit the amount of glare above the horizontal plane of the lamp.

After a year's work a projecting lens was perfected which projected a uniform driving beam, well defined in outline. When this point was reached the company considered the no-glare problem solved. A test pair of the lamps was put in use, fitted with nitrogen bulbs having the front end frosted to cut off direct rays from the filament.

It was found, however, that there was insufficient light directly in front of the car. In order to secure this essential roadside illumination a plane or flat mirror is located close above the bulb, in a horizontal position, with its reflecting surface facing downward. This plane reflector reverses the angle of all the upwardly projected light from the bulb, turning it downward in a wide angle of distribution near the car. Thus an excellent driving light is secured, together with freedom from annoying glare.

We understand that arrangements are under way for the manufacture of this lamp in headlight and windshield floodlight styles.

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Data Sheets on Silent Chains

WE have received from the Morse Chain Co, Ithaca, N. Y., a copy of a booklet of data sheets containing useful information regarding silent chain drives. The data in the booklet cover such subjects as number of teeth and links, lubricating and venting, sprocket materials, chain widths, chain contacts, chain adjustments, etc.

AUTOMOTIVE INDUSTRIES
The Automobile

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The Time Element in Industrial Development

AUTOMOBILE development in this country began in 1895, and it took till about 1907 to develop a really practical, dependable vehicle. This statement may possibly be challenged, because conceptions of a "practical vehicle" differ. On the one hand the vehicles of 1895 carried their loads and ran in a fashion, and, on the other, those of 1907 were still far from the condition of faultlessness. But by 1907 the automobile had attained such a degree of practicability that manufacturers felt safe in investing enormous sums in equipment for its large scale production, and the general public, as distinguished from wealthy sportsmen, began to buy machines. The production curve in 1908 and 1909 showed a decided upward bend which reflects these developments.

From 1900 on, at least, development work was quite intensive. Large numbers of inventors and engineers were active in the field, and capital was quite readily available for what appeared to be meritorious designs, and sometimes, alas, only too readily available for the exploitation of what proved to be absolute failures. On the whole, capital was quite ready to back any likely looking improvement, for the immense possibilities ahead of the automobile industry were apparent to all.

In spite of these favorable conditions it took a round dozen years until a really practical design was evolved. Large were the sums of money that were sunk in fruitless experiment in that period. One is tempted to say "wasted," yet many of the problems could be solved only by trial, and failures were inevitable.

The idea occurs that if development had been spread over a longer period—if the outcome of one experiment had been awaited before another was started upon, the same results could have been achieved at much less cost.

But delay in engineering progress is not tolerated in this strenuous age. As soon as a market develops for any engineering product, competition sets in, and those who lead the way in improvement reap the greatest rewards. In this connection it is interesting to note that the development period of the steam engine was incomparably longer than that of the automobile. In turn the development of aircraft is being forced as no engineering enterprise has ever been forced before. The absolute necessity of quick results fully warrants this procedure, but costly mistakes are an unavoidable accompaniment of such hot-house development.

Why the Unsprung Weight Should Be Minimized

THE rule that the unsprung weight of an automobile should be reduced to the lowest possible figure is generally recognized. It is, of course, violated by the practice of placing the transmission gear on the rear axle, but we remember that one of the earlier prominent champions of this practice did not deny the sound reasoning behind the rule but justified his construction by the statement that his axle with transmission weighed less than other axles of similar cars without the transmission.

The advantage of small unsprung weight, or, in other words, of a light axle, is that the wheels will "keep the road" better; that is, they will not lose contact with the ground as much as the wheels on a heavy axle. This may not be readily apparent, as the heavier axle would seem to press the tire harder to the ground. However, the tire will leave the ground only when the vehicle is proceeding at considerable speed, and in passing over rigid obstacles a blow will be imparted to the wheels and the axle which is directly proportional to the weight thereof.

The force tending to make the wheels adhere to the road, or follow unevennesses in the road bed, is that due to the weight on the wheel, and the greater the total weight on the wheel in proportion to the unsprung weight, the better the wheel will adhere to the road. The effect is much the same as in a valve

operating cam mechanism. In order to make the cam follower follow the contour of the cam even at high speed, we must make the valve and pushrod light and the spring strong.

In a valve mechanism it is very desirable to keep the follower in contact with the cam because that is the condition of noiseless operation. The chief reason for wanting to keep the drive wheels of an automobile in contact with the ground is that this preserves the tires. When the tires alternately are pressed very hard against the ground and leave the ground entirely, considerable slippage between tire and ground surface is inevitable, and such slippage is, of course, very injurious to the tire.

Aside from large unsprung weight causing abnormal tire wear, it also affects the riding qualities of a car detrimentally. As explained in the foregoing, the upward thrust on the wheel when striking an obstruction is proportional to the unsprung weight. A part of this thrust is transmitted to the car body through the springs, and makes itself felt in the form of an unpleasant jolt. The greater the unsprung weight, the severer the jolt.

Specialized Manufacture of Tractor Axles

THE tractor front axle offers an excellent opportunity for a firm in the drop forging business to establish itself in the tractor parts industry. It is hardly necessary to say that this budding industry has a very promising future, and those who enter it early have a chance to secure a firm footing without much competition.

The front axle is one of the few parts of a tractor that are really ripe for specialized production. It should be made in a drop forging, and very few firms producing tractors have sufficient financial backing to enable them to install the relatively expensive equipment required to make such heavy forgings. In fact, the output of the great majority of plants is not sufficient to warrant the installation of the heavy drop hammers, trimming presses, etc.

While there are great differences in the present designs of tractor front axles, that is mainly due to the fact that the different designers had no acknowledged standard to guide them. A great majority of the present tractors have Ackerman steering, with the axle pivoted to the frame at the center. If an axle is offered the tractor designer that has provisions for a swivel support at the center and for fastening radius rods close to the axle heads, he can easily arrange his frame to fit it.

Only a few—probably not more than three—sizes of axles would be required to meet the whole range of tractor requirements. Of course, the three-plow tractor affords by far the best chances for the parts manufacturer, as it is that intermediate size which suits the requirements of a large number of farms and will be concentrated on by a majority of manufacturers or assemblers. An axle for this size of tractor, therefore, would be the best to start out with.

With what eagerness the manufacturers of tractors go in for parts of specialized manufacture that are of sound design and construction is shown by the heavy demands on engine, clutch and transmission manufacturers from the tractor industry. Moreover, the tractor industry is an essential industry—so recognized by the Government—and any effective work toward the improvement of tractors counts toward the winning of the war.

Heels

WERE we gifted with a poetic pen we should write an ode or some other accepted form of verse to the wearer of bloomer overalls and French-heeled shoes. We should ask her not to do it. We should appeal to her on aesthetic grounds. We should tell her that dressed in such a combination she is not so handsome as she might be. We should tell her to wear her French heels, if she will, when she dresses herself in petticoats, but not when she slips on bloomers.

Under the circumstances, however, we shall have to say our say in prose and trust that it may be made effective by adding an appeal to reason.

Besides being something horrible to look upon, the French-heel-bloomer-overall combination is only a half measure from the point of view of accident prevention, and therefore needs further consideration on the ground of safety. This fact is recognized by the New York State Industrial Commission, which has prescribed that women operatives in industrial plants shall wear, besides other things, "shoes with low heels."

It is bad enough to have a large part of our women-folk go tottering through social life on semi-stilts at all angles of inclination, but when we permit these potential accident breeders to become an added industrial hazard we are doing something in which there is no reason.

Encourage the woman operative to wear good square heels, and with her bloomers she will not only retain the attractiveness which is her right, but she will also become a better risk for industrial accident insurance.

England's Dope Scandal

A SITUATION similar to that in our aircraft industry has been revealed in England by an investigation of the dope industry. There were no manufacturers of cellulose acetate in England at the outbreak of the war, and in view of the urgency of the demand the Government was induced to grant a virtual monopoly to a firm started by a foreign capitalist, and to make terms with it which proved exceedingly onerous later on.

The investigation showed that the business was being conducted wastefully and inefficiently. It is now proposed to place the concern under direct Government control, besides which the creation of new sources of dope supply is considered.

Owners' Conception of Tractor Instruction Book

Automotive Industries' Editorial Representative Visits Farmers in Illinois and Secures Their Impressions

THE final test of tractor efficiency must take place upon the farm. The farmer himself must be the ultimate judge. The tractor must meet the individual needs of the farmer who buys it else it is a failure so far as he is concerned. For this reason what the farmer thinks about what the tractor manufacturer and the tractor dealer should do is important to the tractor manufacturer. Here we have the farmer's point of view.

"I think every tractor manufacturer should get out a plain, easily read and comprehensible book about his tractor," says D. W. Rice, who is one of the prominent farmers near Champaign, Ill., and who is a tractor owner. "This book should give complete information about the construction of the tractor and also should have full instructions about its operation. You see, we farmers have to teach ourselves a whole lot about the operation of our machines because we cannot be running to the dealer every time some little thing goes wrong. We haven't the time and we can't afford it. We ought to be able to make the ordinary repairs and adjustments ourselves that may be necessary, and this most of us could do if we knew the 'innards' of our machines, how to get at them and what to do to them when they get out of order. If we could have a book, full of pictures, telling us where every little thing belongs and what it is for and how to fix it when it gets out of kilter, then we would be much better fixed than most of us now are to look after our tractors in the right way."

Tractor Manuals Needed

There are at present no more than two tractor manuals which measure up to the requirements as set forth by Mr. Rice. These both are admirable publications and have contributed materially to the satisfaction the tractors they describe have given. No matter how thorough the instruction may be which the dealer gives to his customer, at the very best it must be elementary and cannot cover all the emergencies which are certain to come up in tractor operation. No matter how perfect a piece of mechanism a tractor may be or to what extent operative troubles have been guarded against by the manufacturer, no one escapes from occasional trouble. For the most part these troubles are trivial, as has been proven by countless responses to calls for assistance, and most of them easily could have been corrected by the farmer himself had he only known how to go about it. This the right kind of a tractor manual would teach him.

To remedy serious troubles, such as breakages and the like, the tractor owner must, of course, look to the dealer. This, however, comes in another branch of service which it devolves upon manufacturer and dealer mutually to provide. But the really annoying things about tractor operation are the inevitable things of a trivial kind which the farmer encounters and which are serious only to the extent that his own ignorance of his machine and of its operation makes them so. Supplied with a manual which is copiously illustrated and which indicates the remedy to be applied in case of common troubles the farmer is far more likely to derive satisfaction from the use of his tractor than he is when he must interrupt his work and wait for a service man to drive out from town.

How the farmer regards such interruptions is expressed by Charles Rhodes, an Illinois tractor owner, who says: "The farmer uses his tractor for necessary work and its value to him lies in its ability to do that work when it ought to be done. When the tractor is out of commission for any cause, the work must stop and the tractor operator is idle. It isn't the same as having something happen to a horse. A farmer nearly always can change teams and go ahead. But when his tractor balks he is helpless. There's nothing to take its place.

Dealer Should Carry Repair Parts

"Then, too, nothing ever happens when it is standing still and doing nothing. It's only when it's needed and it's in use that things go wrong. It means something then for the farmer to be near a dealer who is prepared to give him prompt service when he needs it, and, above all, a dealer who carries at all times a complete stock of repairs. If something breaks in the midst of the plowing season, for instance, and the farmer must wait and delay his plowing until a spare piece can reach him from the factory the delay may rob him of all the advantage his tractor would otherwise be to him. Every tractor dealer, I think, should carry a stock of repairs sufficient to meet all the probable needs of his customers. If the farmer cannot get repairs for his tractor quickly when he needs them then he would better stick to his horses and be done with it."

This brings out clearly the nature and extent of the service obligation the tractor manufacturer and the tractor dealer jointly owe the farmer when the latter buys a tractor. With tractors becoming more and more numerous on the farms of the country this matter of accessibility to an adequate stock of spares is one of increasing importance. Indeed, it is more than important, it is imperatively necessary. When tractors in actual use were fewer in number it was feasible for the manufacturer, either from the factory itself or from branch houses or centrally located distributing agencies, to meet the service needs for a relatively large territory. With hundreds of tractors now in the place of scores, and with thousands in the place of hundreds, this centralized service system no longer is adequate or even possible.

Every Agency a Service Unit

The obvious solution is to make every dealer agency also a service agency for the territory covered by the dealer. This necessitates not only knowledge of what to do in an emergency on the part of the dealer but the possession of the necessary equipment for giving service, including an adequate stock of spares. Many tractor manufacturers already are making it a condition of their agency contracts that the dealer at all times

shall carry a supply of parts sufficient to meet all the probable requirements of his customers. Obviously the size of the repair stock must bear a certain definite ratio to the number of tractors the dealer has sold or may sell in his territory.

It is not only a matter of good business policy to do this. It is as well meeting one of the recognized demands of the trade. The farmer who buys a tractor expects it, and he has a right to expect it. What Mr. Rhodes says is not alone an individual opinion but may be regarded as typical of the views held by farmers on this service question. How much importance the farmer attaches to the dealer giving this kind of service is shown in a further statement by Mr. Rice, already quoted. He says: "If I were favorably disposed to buy a certain tractor, and would buy it in preference to any other, and the dealer who handled it did not carry repair parts for it, I would forget my preference for the tractor and the dealer and would even buy a tractor regarding which I knew little or nothing from some other dealer, provided the second dealer carried spare parts. I think this is one of the most important things a farmer should consider when he buys a tractor."

Maker Should Have Farmer's Viewpoint

This brings out clearly the necessity which faces the tractor manufacturer of taking the farmer viewpoint into consideration and making the tractor dealer conform to it. There is nothing theoretical about the needs of the farmer. They are actual and concrete. From the motive which in the first place induces him to buy a tractor at all to the last application he makes of it as a power unit on his farm the practical rules. There are certain things to be done. There are certain ways in which they should be done. There are certain times when they must be done. The farmer does not buy a tractor to make experiments with nor because he hopes it will do his work better than he has been able to do it in the past. He buys a tractor because he believes it will be a help and an economy to him and that it actually will do his work better.

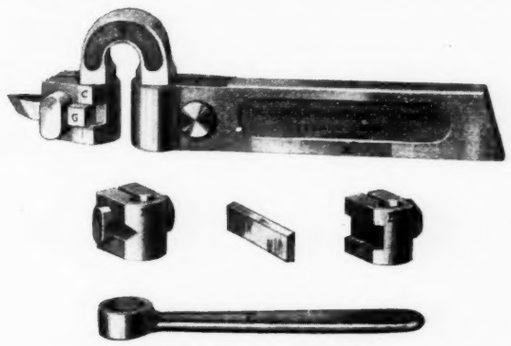
It is up to the manufacturer and to the dealer to see that it does what it should do. In the first place it is incumbent upon both to see that the tractor which a farmer buys is adapted to the needs of that particular farmer, after which every facility should be at hand for keeping that tractor in a constant state of efficiency. This is what the farmer expects, and this measures the extent of the service the manufacturer and the dealer must give. As the man to whom the farmer will look directly for service in the future is the dealer from whom he buys, the manufacturer cannot afford to tolerate a single dealer who fails in the ability, the equipment and the disposition to render service.

Preventing Piston Slap

AN interesting method of preventing side slap of pistons has been devised by A. C. Mason of the Chevrolet Motor Co. Instead of turning the piston cylindrical, as is customary, Mr. Mason turns the skirt of elliptical form. The minor axis of the elliptical cross-section is in line with that of the piston pin, and the major axis is perpendicular thereto. The ring groove flanges and the piston heads are substantially circular in cross-section, and the diameter of this part of the piston is slightly less than the length of the minor axis of the skirt section. The diameters of the ring groove flanges are gradually reduced from the flange nearest the skirt to the head of the piston. It has been found that the skirt of a piston having a major axis equal to 3.685 in. should have a minor axis 0.003 in. to 0.005 in. less in length than the major axis. A very efficient construction is said to be obtained by making the radius of the minor axis 0.002 in. less in length than the radius of the major axis. A British patent on this construction has been issued to Mr. Mason.

Cleveland National Spring Head Tool Holder

A NEW tool holder for finishing work has been placed on the market by the Cleveland National Machine Co., Cleveland, Ohio. The holder has been in use at the plant of the manufacturers for over a year, and it is said to have proven absolutely satisfactory. Its principal object is to relieve chatter and give a smooth cut. The tool can be adjusted either way to an angle up to 90 deg. Three tool clamps are provided,



Spring head tool holder

viz., flat ⅛ x 7/16 in., round 3/16 to 5/16 in. and square 5/16 in. All of the tool clamps are interchangeable, and they can also be inverted so as to throw the tool on either side of the holder. Bits can be used down to ⅝ in. in length, and parting tools as thin as 0.014 in. can be used.

The construction of the tool holder with its spring head is obvious from the illustration. The spring has sufficient strength to stand up to all finishing work that would ordinarily be done on a lathe taking a ½ x 1 1/16 in. shank.

Correction on Traction Hitch Article

MOMENTS were incorrecly taken around the center of the rear axle in the article on tractor hitches which appeared in AUTOMOTIVE INDUSTRIES for June 27 on page 1257. The last paragraph on page 1257 and the first two on page 1258, as well as Fig. 1, are incorrect as the moments should have been taken about the point of contact of the wheel and the ground. The paragraphs in question should read as follows:

Taking moments about the point of contact of the rear wheel and the ground we find, referring to Fig. 1, that the drawbar exerts an unbalanced moment of 1800 ft.-lb. in a clockwise direction. The weight moments through the center of gravity and the front wheels cancel out, leaving a lifting moment of 1800 ft.-lb. on the front wheels counteracted by a weight moment on the front wheels of 4800 ft.-lb.

The total moment tending to keep the front wheels on the ground is thus only 3000 ft.-lb. instead of 4800 and gives a virtual backward shift to the center of gravity of 10.8 in., lessening the load on the front axle by that amount.

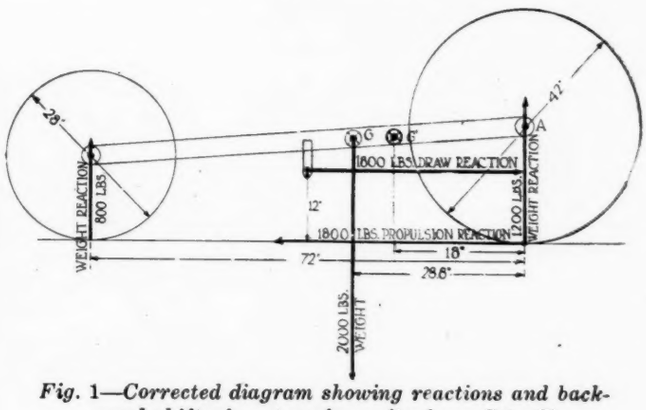


Fig. 1—Corrected diagram showing reactions and backward shift of center of gravity from G to G'

□ Latest News of the

Abandon National Shows During War

National Automobile Chamber of Commerce Unanimously Votes to Eliminate New York and Chicago Exhibitions—New York May Have Truck Exhibit—Local Show Situation Unsettled

NEW YORK, Sept. 5—The National Automobile Chamber yesterday voted unanimously to abandon the National Automobile Shows during the period of the war. The action was taken at the monthly meeting of the Board of Directors and the reason ascribed is to "further co-operate with the governmental authorities in conserving labor, fuel and transportation."

Thus, for the first time in 18 years, the great national exhibitions of passenger cars and accessories which have drawn the public by tens of thousands to Grand Central Palace in New York and to the Coliseum and the First Regiment Armory in Chicago will not be held.

There is a possibility, however, that New York may see an exhibition of commercial vehicles. For some time the Motor Truck Club of America has been carrying on negotiations for a lease of Madison Suare Garden in which to stage a motor truck show. Arrangements have been carried to the point where it is expected that the contract will be signed this week, provided sentiment favors such an exhibition in view of the action of the N. A. C. C. in abandoning passenger car shows for patriotic reasons.

Just what effect the abandonment of the National shows will have on the dealer shows such, for example, as Boston, Kansas City, Minneapolis, etc., is not known and it is a little early to predict. The National Association of Show Managers, representing practically every important local automobile show says:

Local Shows Unsettled

"It is not possible at this time to state exactly what will happen in regard to the dealer shows although the probability is that there will not be the number held in previous years. Passenger car exhibits are, of course, hardly to be considered; however, there are so many other automotive activities in certain sections, especially in the large agricultural centers that the exhibition situation of next winter can hardly be foretold. One thing is assured, and that is that there will be no shows unless they have the full approval of those who are running the country's industrial war machine."

Local shows have yearly assumed greater importance. The annual Boston show which always has been the great gathering place for dealers, not alone from New England, but from all over the East, last year drew an attendance of 225,000; last year both Kansas City and Minneapolis staged exhibitions that were easily the most important events of the kind that were held during the year in their respective territories. The Minneapolis show was the greatest automotive exhibition that has ever been held and was larger, both in area and in the number of exhibits than both the New York and Chicago shows together.

The situation with regard to the annual Importers' Salon which is held in the Hotel Astor, New York, is chaotic. It is not unlikely that this, too, will be abandoned.

The action of the N. A. C. C. was not altogether unexpected. Last year the trade wondered whether in view of the war the shows should be put on. This year sentiment against the shows has been augmented by the difficulty of obtaining a place in which to hold the New York exhibit. It has been rumored that Grand Central Palace has been taken over by the government and will be converted into a mammoth hospital. The rumor cannot be confirmed but there seems more than a grain of truth in it.

First Show in 1900

America's first automobile show was held in Madison Suare Garden during the week of Nov. 3, 1900, and was almost immediately followed by the first annual show in Chicago. Surrounding the arena on the main floor of the Garden was an oval track where cars were demonstrated to prove to the skeptical public that they really would run. Rising high above the roof of the Garden was built a plank incline with steep gradiant on which the hill-climbing ability of the little steamers of that period was demonstrated. Steam vehicles predominated at that show and for several years thereafter with electric cars occupying second place and gasoline vehicles a bad third. A dozen or more companies whose cars have since become known all over the world were represented at the first show. It was during this first show that the National Association of Automobile Manufacturers was formed.

The second New York show was also held in the Garden in November, 1901, and held a total of 93 exhibitors—nearly twice as many as the first—and the demonstrating track was omitted. At the 1903 show there were 154 exhibitors, 185 in 1904 and 250 in 1905. This number has grown each year until at the last exhibition, which several years ago outgrew Madison Square Garden, and has been housed in Grand Central Palace, there was a total of 335 exhibitors. Chicago has fully kept pace with the New York show and in the number of exhibits has often excelled it. Its central location has resulted in an enormous attendance of dealers and other representatives of the industry, more than 3000 dealers having attended last year.

Like the New York show, the Chicago show several years outgrew the Coliseum and during the last few years has required this building and the first Regiment Armory as well.

Statement of the N. A. C. C.

Following is the statement of the National Automobile Chamber of Commerce:

With a view to further co-operating with the governmental authorities in conserving labor, fuel and transportation, the Directors of the National Automobile Chamber of Commerce at their meeting yesterday, unanimously voted voluntarily to recommend to the members the abandonment during the period of the war, of the automobile shows held annually for 18 years in New York and Chicago.

The makers present felt that the holding of automobile shows would be inconsistent with the patriotic obligations of the industry.

At its previous meeting the N. A. C. C. working with the War Industries Board, voluntarily agreed to curtail production of passenger cars to 50 per cent of the production of 1917, and recommended that all automobile companies take on war work as rapidly as it is obtainable.

—

Stutz Profits Decrease $221,912

INDIANAPOLIS, Sept. 4 — Gross profits of the Stutz Motor Car Co. decreased $221,912 during the 6 months ending June 30, 1918. The total profits were $424,253 which is equal to $7.30 a share on 75,000 shares outstanding. This compares with $8.29 a share for the corresponding period of 1917. Following is the income account as of June 30:

	1918	1917	Decr'se
Net Sales.....	$1,935,957	$2,489,622	$553,665
Cost of sales....	1,511,704	1,843,457	331,753
Gross profits....	$424,253	$646,165	$221,912
Selling, administra and gen. expen.	35,374	50,317	14,943
Balance	$388,879	$595,848	$206,969
Int. & dis. earned	9,187	25,927	16,740
Net profit 6 mos	$398,066	$621,775	$223,709

Automotive Industries

Treble Tax on Cars; Double Trucks

New Revenue Bill Also Taxes Accessories Including Tires—Owner's Horsepower Levy

WASHINGTON, Sept. 4—The manufacturer's tax on passenger cars is more than trebled and the tax on motor trucks nearly doubled in the draft of the new War Revenue Bill which has been presented to the House of Representatives by Chairman Claude Kitchin of the Ways and Means Committee. In addition, there is a provision to tax owners of passenger cars on a horsepower basis and a tax of 2 cents a gallon is placed on gasoline.

Under the terms of the new measure, passenger cars are placed in a so-called "luxury list," and, along with such products as candy, cosmetics, chewing gum, etc., are to be taxed 10 per cent on the selling price instead of the 3 per cent which now is assessed. Motor trucks, on the other hand, are to be taxed only 5 per cent. For the first time, a tax has been placed on automobile accessories, including tires and tubes, the amount being 10 per cent. Motorcycles are to be taxed 10 per cent.

It is estimated that these taxes will produce $123,750,000 and that the horsepower tax to be paid by passenger car owners will produce an additional $72,920,000. The horsepower tax will be based on the standard method of calculating horsepower by the S.A.E. formula.

Following are the provisions of the new measure which apply particularly to the automobile industry:

Accessories Taxed 10 Per Cent

SEC. 900. That there shall be levied, assessed, collected, and paid, in lieu of the taxes imposed by section 600 of the Revenue Act of 1917, upon the following articles sold or leased by the manufacturer, producer or importer, a tax equivalent to the following percentages of the prices for which so sold or leased—

(1) Automobile trucks, automobile wagons, automobile trailers or tractors (including tires, inner tubes, parts, and accessories therefor sold on or in connection therewith or with the sale thereof), 5 per centum;

(2) Other automobiles or motorcycles (including tires, inner tubes, parts, and accessories therefor sold or in connection therewith or with the sale thereof), 10 per centum;

(3) Tires, inner tubes, parts or accessories, for any of the articles enumerated in subdivision (1) or (2), sold to any person other than a manufacturer or producer of any of the articles enumerated in subdivision (1) or (2), 10 per centum;

SEC. 902. That there shall be levied, assessed, collected, and paid upon all gasoline, naphtha, and other similar petroleum products, having a flash point below 100 degrees Fahrenheit, as tested by the Taglibue open cup tester, and suitable for motor power, sold by the manufacturer, refiner, or importer, a tax of 2 cents a wine gallon.

Owner's Automobile Tax

SEC. 1006. That sixty days after the passage of this act, and thereafter on July 1 in each year, and also at the time of the purchase of a new or used automobile or motorcycle by a user, if on any other date than July 1, there shall be levied, assessed, collected and paid, upon the use of automobiles and motorcycles, a special excise tax at the rates as follows: Motorcycles, $5; automobiles (other than electric) of 23 horsepower or less, $10; more than 23 horsepower and not more than 30 horsepower, $20; more than 30 horsepower and not more than 40 horsepower, $30; and more than 40 horsepower, $50; electric automobiles, $5 per horse power and 50 cents for each 100 pounds of weight.

In the case of a tax imposed at the time of the purchase of an automobile or motorcycle or any other date than July 1, and in the case of the tax taking effect sixty days after the passage of this act the amount to be paid shall be the same number of twelfths of the amount of the tax as the number of calendar months (including the month of sale or the month in which is included the sixty-first day after the passage of this act, as the case may be) remaining prior to the following July 1.

For the purposes of this section the horsepower of all automobiles other than steam or electric shall be computed as follows: Square the diameter of the cylinder in inches, multiply by the number of cylinders, and divide by two and one-half. In the case of steam or electric automobiles the horsepower for the purposes of this section shall be the horsepower rating fixed and advertised by the manufacturer or importer thereof at the time when sold by him.

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Canada Takes Control of Steel

MONTREAL, Sept. 5—The Canadian government has taken over the control of steel products in Canada through its War Trade Board. The board will have full authority to direct the extent and character of the steel produced by the various companies but will have nothing whatever to do with the financial or general management of the concerns. The object of the measure is to co-ordinate producing power and insure maximum production.

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Enlarge "Essential Industry" Group

WASHINGTON, Sept. 5—The 64 original industrial groups which the War Industries Board classed as being essential have been enlarged to 69 groups. It is expected that the list will be completed and ready for publication early next week. The original plan is to be modified so that non-essential industries will be given a place on the preferential list while engaged in war work.

Gasoline Saving Was 100,000 Barrels

Fuel Administration Takes Census of Cars Running—Illinois Leads the List

NEW YORK, Sept. 5—It is estimated that between 100,000 and 150,000 bbls. of gasoline were saved in the states east of the Mississippi River by the first motorless Sunday. This is as close as the Fuel Administration can come to the actual figures. These figures were compiled at the instigation of the National Petroleum War Service Committee and reveal that Illinois leads the conservation list through a saving of 95 per cent of the quantity normally used.

In order to obtain the data, a census was taken of all cars passing certain key points between 2 and 4 p. m. on Saturday, Aug. 31, and during the same time on Sunday in the 25 states west of the Mississippi. The difference in the count of cars is taken to represent a fairly accurate figure on the number of cars in use.

It is estimated that the quantity of gasoline that will be saved next Sunday will be still greater when motorists become more familiar with the request of the Fuel Administration and have had a little more time to rearrange their schedule.

Following is the result of the test:

	Sat., Aug. 31	Sun., Sept. 1	P. C. of Reduction	No. of Cars Registered*
Illinois	19,997	1,006	95	340,292
Ohio	28,774	1,952	93	425,789
Wisconsin	2,181	183	90	182,700
Dist. of Columbia	7,939	774	90	36,969
Kentucky	3,596	891	90	57,543
West Virginia	826	107	87	36,400
Louisiana	3,269	429	87	38,000
Tennessee	10,115	1,265	87	54,000
Indiana	2,165	334	85	209,346
Maryland	6,400	989	84	63,827
Florida	2,282	361	84	43,746
Maine	906	149	83	39,538
Massachusetts	1,947	354	81	166,384
Alabama	3,589	668	81	44,859
Pennsylvania	46,923	8,765	81	344,877
Connecticut	8,592	1,721	80	75,900
Rhode Island	3,396	625	80	26,399
New Jersey	14,663	2,805	80	137,322
Georgia	4,750	906	80	89,876
New York	17,627	4,617	74	422,853
Mississippi	2,016	583	71	37,500
North Carolina	906	282	68	62,071
South Carolina	680	230	66	48,350
Michigan	6,378	2,245	65	242,712
Virginia	1,499	549	63	65,000

*Automotive Industries census.

General Staff Holds Truck Control

Reorganization Order Places Motor Transport Corps Under Army Supervision

WASHINGTON, Aug. 31—That the Motor Transport Corps of the U. S. Army, recently formed as told in a past issue of AUTOMOTIVE INDUSTRIES, will remain directly under the supervision and direction of the General Staff is shown by the reorganization of the General Staff with an Operations Division which will contain a Motor Transport Branch to supervise the Motor Transport Corps. This branch will consequently be the supreme body governing purchase, procurement and design of the motor vehicles of the army. The General Staff is the division of the army that plans, develops and executes the army program directly under Secretary of War Newton D. Baker.

This new reorganization apparently means that the Motor Transport Board, comprising officers of the various army corps and bureaus and which is the consulting board working with the Chief of the Motor Transport Corps, will hereafter operate under the direction of the General Staff Branch.

The three directing officers of the Motor Transport Corps are members of the General Staff and since the announcement of the order of reorganization specifically states that no change of personnel is affected, it is expected these officers will form a part of the Motor Transport Branch of the General Staff.

The order which is known as General Order No. 80 also states that the object of the reorganization is to prevent duplication and to correlate the motor activities of the various army bureaus.

It is further stated that in aircraft production, aircraft operations and tank activities will operate directly under the supervision of the Chief of the General Staff in so far as military affairs are concerned.

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Barley Figuring on War Work

KALAMAZOO, Aug. 28—The Barley Motor Car Co. is actively engaged in working out plans to adjust the plant to war work. The company is now figuring on a good portion of Government work. The three-story factory buildings cover 11 acres of ground and have 350,000 sq. ft. of floorspace. The plant is equipped to assemble trucks that do not require unduly large machine tool capacity.

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Signal Corps Loses Aircraft Supplies

WASHINGTON, Aug. 30—The transfer of all aviation and aircraft property now carried by the Signal Corps to the Division of Military Aeronautics and the Bureau of Aircraft Production is ordered by War Department General Orders No. 51. The order authorizes the transfer of all aircraft supplies consisting of those necessary for the production of airplanes, airplane engines, aircraft equipment, unfinished, unattached or unassembled airplanes, airplane engines or aircraft equipment. These supplies will automatically transfer and become aviation supplies on their delivery to the Department of Military Aeronautics by the Bureau of Aircraft Production.

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Standardize Oil Specifications

WASHINGTON, D. C., Aug. 31—The Specifications Commission of the Allies has arrived in Washington to discuss the standardization of specifications for petroleum products for use by the American Government and the Allies. President Wilson recently announced in a proclamation that standard specifications would be drawn up and appointed an American committee, as was announced in a past issue of AUTOMOTIVE INDUSTRIES.

The Specifications Commission from London comprises: W. Fraser, chairman; H. R. J. Conacher, secretary; Engineer Commander A. E. Hyne, Royal Navy; Captain W. E. Guttentag, British Air Ministry; Captain E. C. Paix, French Army; Captain L. Noyer, French Army; Major Galileo, Italian Navy.

The commission met in conference today with the American Committee on Standardization of Petroleum Products, composed of the following members: M. L. Requa, general director oil division, U. S. Fuel Administration, chairman; J. W. Williams, secretary; Col. George E. Warren, appointed by Secretary of War; Admiral R. S. Griffin, appointed by Secretary of the Navy; H. L. Doherty, appointed by chairman of Shipping Board; C. B. Young, appointed by Director General of Railroads; C. H. Beal, appointed by Director of Bureau of Mines; Dr. C. W. Waidner, appointed by Director of Bureau of Standards. Further conferences will be held from day to day.

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Tractor Demonstration for Pennsylvania

HARRISBURG, Sept. 3—The State of Pennsylvania will conduct state farm tractor demonstrations on Sept. 19, 20 and 21, when 250 acres for winter wheat will be plowed and cultivated. Plowing is to be done on Sept. 20, when 7 hr. will be given over for this work, from 9 to 12 in the forenoon and 1 to 5 in the afternoon. On the third day, Sept. 21, the tractors will disk, pulverize and sow the wheat. The first day will be very largely given over to getting ready for the work. In these tractor demonstrations it is planned to keep a very complete record of the performance of each tractor, with regard to fuel used, oil required, plowing speed, depth, number of stops, delays, etc.

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Fordsons at Ohio Fair

COLUMBUS, Aug. 31—One of the biggest attractions at the Ohio State Fair, which closed to-day, was an exhibit of 55 Fordson tractors under the charge of E. H. Bryant, distributer for Ohio.

Purchasing Agents Convene Sept. 23

Expected That More Than 100 Will Attend 3-Day Meeting —The Program

DETROIT, Aug. 28—Vigorous plans are on foot for the entertainment of the convention of the National Association of Purchasing Agents, which will be held in this city Sept. 23, 24 and 25. It is expected that more than 1000 purchasing agents from all lines of industry will attend this convention, and a big step toward the consolidation of the buying interests of the country will be made on this occasion. The association has already made considerable progress toward the standardization of catalog sizes and is rapidly obtaining the recognition of the largest business interests. During the past year the membership has tripled and is expected to be augmented by the addition of several new branches during the coming fall. The convention headquarters will be the Hotel Pontchartrain. The program of the convention will be as follows:

Sept. 23:

9.30 A. M.—Meeting of Board of Directors.

10.30 A. M.—Convention called to order by E. L. McGrew, President.

2.00 P. M.—"How the Purchasing Agent may serve the nation in his work," by C. A. Woodruff, Saxon Motor Car Co., Detroit, Mich.

"Standardization of printed matter—present and prospective developments," W. L. Chandler, of Dodge Sales and Engineering Corp., Mishawaka, Ind.

"Trade acceptance from the buyer's viewpoint," H. E. Cass, of Merrell-Soule Co., Syracuse, N. Y.

6.30 P. M.—Smoker and entertainment. Dinner and theater party for lady visitors.

Sept. 24:

9.30 A. M.—"Commercial Bribery—Cause, effect and remedy," W. P. Ogden, of Scovill Manufacturing Co., Waterbury, Conn.

"Should the stores department be under the Purchasing Agent's control?" Wm. Guggenheim, of Bauer Brothers Co., Springfield, Ohio.

"Buying substitutes," F. J. Solon, of Owens Bottle Machine Co., Toledo, Ohio.

2.00 P. M.—Automobile tour of Detroit followed by visits to manufacturing plants.

7.00 P. M.—Annual banquet.

Sept. 25:

10.00 A. M.—Business session.

Election and installation of officers.

Deciding place of next convention.

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To Speed Up Brass Production

WASHINGTON, Aug. 30—Brass manufacturers met here to-day with the War Industries Board to discuss plans to speed up rolled brass mills production. Plans suggested were:

1—Each mill to take its full share of Government business.

2—Each mill to take work best suited to its equipment.

3—Each mill to cut off all non-essential uses of the products in which there is a shortage.

4—Each manufacturer to get out his product in the face of obstacles to work up to full capacity.

There is a shortage of rolled brass for shells, cartridges, condenser tubes, etc. Labor has been a serious obstacle in the way of increased production. It was stated that with 9600 additional unskilled workers the mills could increase their output 33 1/3 per cent. The gross production of rolled brass now is 2,910,000 lb. per day. Gross demands, according to the listed figures, are 4,685,000 lb. per day. A number of plants are installing additional facilities and will soon increase their output.

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Would Aid Mineral Production

WASHINGTON, Aug. 31—Stimulation in the production of such metals and minerals as antimony, cobalt, manganese, platinum, tin tungsten and vanadium is provided for in a bill just introduced by Senator Henderson of Nevada, and referred to the Mines Committee. Under its provisions the President would be authorized to requisition and take over any undeveloped or insufficiently developed deposit, mine, smelter or part thereof and to operate under government direction either under a lease or any other agreement. The bill, however, does not affect gold, silver, copper, lead or zinc production or smelters used in their production.

The bill also creates a revolving fund of $50,000,000 to carry out the purposes of the act. If in the President's judgment such action is necessary one or more corporations can be established for the purpose of encouraging the production or controlling the distribution of metals. By this provision, Senator Henderson explained, it would be possible for the President to organize a corporation, with the Secretary of the Interior at the head, for the purpose of developing production in western states and another of chairman of War Industries Board as head, which would be in charge of distribution. The bill is a war measure and the powers conferred by it would terminate two years after peace is declared.

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War Industries Board Creates New Section

WASHINGTON, Aug. 31—The War Industries Board has created a new section to be known as the Facilities Division, which will determine new or additional facilities in any line of production necessary to the conduct of the war, the possibilities of expanding existing facilities, and the best means of creating and locating new facilities. Samuel P. Bush is at the head of the new division and associated with him is D. R. McLennon of Chicago. The Facilities Division will work co-operatively with the Resources and Conversion Section.

May Pay Over 25% of Government Cost

President Nullifies Law Limiting Production Payments—Correct Estimating Hard

WASHINGTON, Aug. 31—The President to-day nullified by an executive proclamation the recent action of Congress providing that the Government should not pay an excess of 25 per cent over the cost of production to any manufacturer of raw materials.

An amendment to the army appropriation bill carried the provision which the President has set aside. Congressmen charged that contractors were making excessive profits, but the President states that, "in view of the practical impossibility under existing conditions of making the estimates necessary to comply fully and adequately with said provisions, it appears that the situation is such as to justify a waiver of said provisions," thereby expressing his opinion that it is not possible to forecast in advance of a contract just what the cost will be. The President's proclamation is as follows:

"Whereas, By the Act of Congress, approved July 8, 1918, Public No. 189, 65th Congress, it is provided

"That except as expressly otherwise authorized herein no part of the sums appropriated by this Act shall be expended in the purchase from private manufacturers of any material at a price in excess of 25 per centum more than the cost of manufacturing such material by the Government, or, where such material is not or has not been manufactured by the Government, at a price in excess of 25 per centum more than the estimated cost of manufacture by the Government; provided, that whenever in the opinion of the President the situation is such as to justify such action he may waive the limitations contained in this section;

"And whereas, in view of the practical impossibility under existing conditions of making the estimates necessary to comply fully and adequately with said provisions, it appears that the situation is such as to justify a waiver of said provisions,

"It is hereby ordered that during the present national emergency the limitations contained in the above section be and the same are hereby waived.

"WOODROW WILSON.

"The White House, Aug. 29, 1918."

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Special Italian Export License

WASHINGTON, Aug. 31—Exports to Italy are hereafter forbidden unless an import license is secured from the Italian Government, according to an announcement made to-day by the War Trade Board.

Applications for licenses to import into Italy any commodity of foreign origin must be filed by the Italian purchasers with the Giunta Tecnica Interministeriale, Rome, before the placing of orders abroad.

After licenses to import have been granted by the above body, the orders may be placed abroad. The prospective importers should advise the prospective exporters in the United States the numbers of such import licenses, in order that the latter may designate such numbers in their applications for licenses to export from the United States.

Import licenses issued by the Giunta Tecnica Interministeriale are valid for only one shipment, even though such shipment covers only part of the commodities originally licensed for import into Italy.

The Giunta Tecnica Interministeriale will cable to the Italian High Commission in Washington the numbers of the import licenses granted, so that such Commission may approve the corresponding applications for export licenses when filed with the War Trade Board.

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Ford to Turn War Profits to Government

DETROIT, Aug. 31—Henry Ford will turn back to the Government his entire share of profits gained on war work contracted by the Ford Motor Co. This means that hundreds of thousands of dollars will be returned to the Government. Ford does not hold any of the war contracts personally, but the Ford Motor Co. in which he owns over one-half of the capital stock received the Government business and it is only the disposition of his own shares that Ford has reference to. It is not stated whether the other stockholders will follow suit and return their profits also.

The company is working on Liberty engine cylinders, Liberty engines, caissons for Ordnance Department, helmets, tanks, the naval boats known as Eagles, and other work.

None of the contracts having been completed, no profits as yet have been paid. Various contracts are progressing and the Government is paying the bills for costs, as they are rendered from time to time. Profits will be figured at the completion of the work. At that time Ford will turn his portion of such profit into the United States treasury.

These various contracts were taken at the solicitation of the Government at prices fixed by it and which prices include a profit of about 10 per cent more than cost. The price on Liberty engines was fixed by the Government, but the Ford Motor Co. later voluntarily reduced the price something like 18 or 20 per cent and filed supplementary contracts with the Government on the revised figure.

Ford personally was willing to do all of this work without profit, but he was advised that this could not be done without violating the duty of the officers to stockholders, and besides the Government officials preferred that the contracts should carry with them the same terms as those which had already been made with other contractors for the same kind of work.

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Ford Has 5000 Service Stars

DETROIT, Aug. 31—There are now 5000 stars in the service flag of the Ford Motor Co. Among those who are represented in the flag are 400 repairmen serving in France as a unit.

Exports to Norway Restricted

Requests for Licenses to Export Tires and Oil Now Require Definite Guarantee

WASHINGTON, Aug. 31—Applications for licenses to export automobile and motorcycle tires and tubes and oils to Norway which are not controlled by a Norwegian import association, states the War Trade Board, will not be considered unless the prospective importer has given a guarantee certified by the Norwegian Finance Department and further certified by an American consul in Norway who will furnish the importer an identification number.

It is no longer necessary to have a code word with the identification number. The number should be forwarded by the importer to the prospective exporter in the United States and specify on supplemental information sheet X-106, which should be attached to the application for an export license.

Applications for licenses to export automobile and motorcycle tires and tubes and oils which are controlled by a Norwegian import association must be accompanied by a certificate secured by the importer from the association. This certificate must be either issued or confirmed subsequent to May 10, 1918. The identification number of the certificate should be forwarded by the importer in Norway to the exporter in this country and specified on the supplemental information sheet X-106, which must be properly executed and annexed to the application for export license.

In filing an application for a license to ship these commodities the shipment must be consigned to the association which has issued the certificate, and the exporter must state the name of the person or firm in whose favor the imports certificate was issued, as for example:

Consignee { Royal Norwegian Automobile Club

Purchaser Abroad { (Here state person or firm to whom certificate was issued) / Address of such person or firm

The War Trade Board states that the following import associations in Christiania will accept consignments of the following articles on behalf of the Norwegian importer actually interested:

Royal Norwegian Automobile Club—Automobile tires and tubes, motorcycle tires and tubes.

Norwegian Cycle Tire Importer's Association—Bicycle tires.

Lubricating Oil Merchants' Association—Lubricating oils, lubricating greases.

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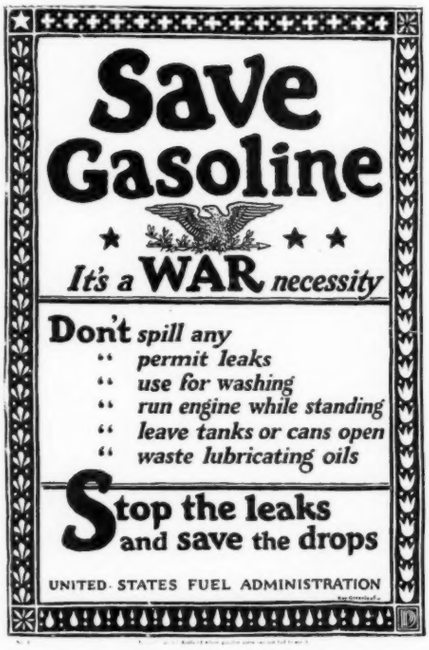
Air Mail Service Successful

WASHINGTON, Sept. 3—The air mail service between Washington, Philadelphia and New York operated during August without any serious delay or miss. There were 27 flying days during which 108 legs of the journey were made and during this time but two forced landings were made, one with the delay of 7 min. and the other less than 10 min. One forced landing was made within 4 miles of Belmont Park, the end of the journey, and was caused by a break of the magneto shaft. The other forced landing was caused by a compass fault, obliging the pilot to land to pick up his course when the instrument failed to operate. The total possible miles of flight were 11,961, of which 11,957 were completed.

During the first 10 days of the month army fliers operated the planes and during the last 20 days the routes were handled by civilian fliers of the Post Office Department, following the taking over of the air mail service from the War Department by the Post Office Department. A total of 5879 lb. of mail was carried. A rigid mechanical maintenance service has been inaugurated, and during the last month not one of the 15 planes in the service was laid up for repairs.



This is the poster which the Fuel Administration has prepared and which will be distributed all over the country in the gasoline-saving campaign

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Big Drop in British Imports

LONDON, ENGLAND, Aug. 15—In the fiscal year ending March 31, 1917, there were imported into Great Britain 440 complete motor cars as compared with 5740 the previous year. There were imported 105 chassis as compared with 330 in the previous year; and 655 complete motorcycles as compared with 750. This at 33 1/3 per cent duty which is imposed on automobiles, motorcycles, accessories and components brings the revenue to $1,068,645.

No More Priorities for Refineries

Present Refining Capacity Considered Ample—Necessary Enlargements Allowed

WASHINGTON, Aug. 31—Priorities for materials to be used in the construction of new oil refineries will not be approved, according to an announcement made to-day by the Fuel Administration. The present refining capacity in the mid-continent oil fields is considered ample. Priorities will be approved for materials to maintain existing facilities and for such additions thereto as are necessary in the national interest.

Reasonable use of gasoline-driven vehicles as a means of necessary transportation where no other means are available is not prohibited by the Sunday driving ban, says the Fuel Administration. The intention is that all mere pleasure riding be eliminated, but that necessary use of the automobile should not be interfered with. The individual is expected to determine conscientiously the difference between "pleasure riding" and "necessary use." The Fuel Administration will not attempt to tabulate Sunday automobile traffic.

That the measure is regarded as a temporary one, likely to be enforced only for a few Sundays, is shown by the following statement by M. L. Requa, Director of the Oil Division of the U. S. Fuel Administration:

"Motorists are requested," said Mr. Requa, "to initiate every means of conservation possible in the handling and use of gasoline and lubricating oils. The useless operation of engines when the car is not in motion must be discontinued. Extreme care must be exercised that gasoline and oil are not spilled; that leaks are not tolerated and evaporation not permitted. The gasoline and lubricating oil user must realize that there is not an inexhaustible supply of crude oil, and he must appreciate the fact that the need for it now exceeds that of any previous time.

"War needs must be first supplied. By conserving through the non-use of motor-driven vehicles for a few Sundays and the exercise of care in the use of gasoline and oil during other days, there probably will be no necessity for more severe control.

"If this program is followed to the extent that the Fuel Administration believes it will be, a few Sundays will effect the desired conservation."

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Test Chicago-New York Air Mail Service

WASHINGTON, Sept. 3—Air mail service between New York and Chicago will be tested Thursday, Sept. 5, by the Post Office Department, when a Curtiss and a Standard airplane, each carrying mail, will leave Belmont Park at New York at 6 a. m. to arrive at Chicago at 4 p. m. If successful, this will be the first time that a machine has flown between the two cities in 1 day. The route will be called the Woodrow Wilson Air Way. Stops will be made at Lock Haven at 8.30 a. m., Cleveland at noon, and Bryan, Ohio, at 1.30 p. m., for gasoline

and oil. The schedule calls for a speed of 80 m.p.h., which can be easily maintained unless diverse head winds are encountered. The pilots will chart the course for distinguishing landmarks, safe landing places and to discover the mountains and ravines which create air currents.

The return trip will be made on Saturday, Sept. 7, starting from Grant Park, Chicago, at 6 a. m. The total distance is 745 miles. The postage rate will be the same as on the New York-Washington route, 16 cents for the first ounce and 6 cents for every ounce thereafter. If the service is successful it is expected the Post Office Department will install night air travel between the 2 cities next spring when the planes will leave New York City at 9 p. m. with the heavy afternoon mail and arrive in Chicago for the first morning delivery.

The New York-Chicago route, if established, will be the last air route installed by the Post Office Department until the end of the war.

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Warns Against Use of Agents to Secure Priority Certificates

WASHINGTON, Aug. 31 — Manufacturers and the public generally are advised of the uselessness and inadvisability of employing agents to obtain priority certificates or preferential treatment from the War Industries Board in an open letter by Edwin B. Parker, Priority Commissioner of the Board. The letter follows:

TO THE PUBLIC:

"The attention of the Priorities Division of the War Industries Board has been called to the fact that certain individuals are offering their services and soliciting employment to present priority applications and procure the issuance of priority certificates, and also to use their alleged influence in having industries accorded preferential treatment.

"The rules and regulations of the Priorities Division are clear, simple, can be readily followed and will be furnished to anyone applying therefor. The employment of agents not only burdens the applicant for priority with a wholly unnecessary expense, but an attempt on the part of such agents to exert personal influence—which it is needless to say they do not possess—may have a tendency to prejudice the applicant's cause.

"EDWIN B. PARKER,
"Priorities Commissioner."

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Milwaukee Dealer Convention Sept. 11

MILWAUKEE, Sept. 2 — The Milwaukee Automobile Dealers' Association has taken the initiative in the organization of a state association of dealers and garagemen by calling a mass meeting at Milwaukee on Wednesday, Sept. 11, during State Fair week. Invitations have been issued to approximately 1700 members of the trade in Wisconsin to attend a dinner at the Milwaukee Athletic Club, to be followed by an organization session, at which it is hoped to present F. W. Vesper, St. Louis, president of the National Automobile Dealers' Association, and E. E. Peake, Kansas City, executive secretary of the N. A. D. A., as the principal speakers.

Michigan Now Short 10,000 Men

Employment Office Unable to Supply This Number—Machinists Most Needed

DETROIT, Aug. 30—The Michigan district of the United States Employment Service estimates the present shortage of labor in this state to be over 10,000 men. The office arrives at this figure by taking into consideration the number of men demanded by the industries and which the office is unable to secure to meet requirements.

The office receives requisitions from industries every week for 10,000 more men than it is possible to supply. Half of this demand is for highly skilled men and the other half is for common labor; there is only a slight shortage of semi-skilled workers. Of skilled workers, 90 per cent of the demand is for all around machinists; the remaining 10 per cent is for tool makers.

The recent announcement of a shortage of 30,000 men prevailing here was rather misleading, according to an official of the government office. The estimate, he believes, was based on an anticipated demand due to the increasing volume of war work rather than on an actual count of present requirements. Owing to the adjustments made in the various industries the actual labor shortage has not developed to such great proportions as anticipated.

Detroit Places 4000 Men

The Detroit offices placed a total of 4000 men last week, of which 65 per cent were semi-skilled men and the balance was evenly divided between common and skilled workers. The week previous a total of 3200 men were placed.

When Provost Marshal-General Crowder's recent "work or fight" order was put into effect an increase of 5 to 10 per cent in the number of applications coming in was noted, but this order is not credited for the stimulation, as a steady increase is manifested from month to month. The number of men placed each month is always greater than that of the preceding month. The office is at a loss to know where all the men come from. Of course, a small percentage of this number are "come-backs."

It is believed that the general conditions are having an influence on men, causing them to seek more essential work. The men early foresaw the present situation and voluntarily set about to seek places of employment where they would be less liable to be disturbed by the Government.

For the 6-month period—Jan. 1 to June 30, 1918—the Detroit office placed a total of 12,874 men. Between the months of April and May a very marked jump in the number of applications is recorded. Twenty per cent more business was done during this period than any time previous or since. With the exception of this period the percentage of increase has been almost uniformly 5 per cent.

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Steel Inventories Asked

WASHINGTON, Sept. 3—A nation-wide inventory of stocks of steel on hand is being made by the War Industries Board in co-operation with the Department of Commerce to ascertain the supply of steel. The deficiency of production of steel for direct and indirect war needs is the cause of the inventory. More than 40,000 manufacturers have been asked by questionnaires to report the stocks of steel. The present estimated total production of steel is 17,000,000 tons and war demands total over 23,000,000 tons and are constantly increasing.

A number of industries, says the statement issued by the War Industries Board, such as the automobile industry, have been called upon to report stocks of steel on hand so that the War Industries Board could be guided in making an intelligent administration of the steel stocks, but the Board decided that it was necessary to gather complete information from all steel-using industries determined on a general inventory from all manufacturers.

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Aircraft Bureau Needs Men

WASHINGTON, Sept. 3—An urgent need for accountants and manufacturing cost clerks who have had either office or factory experience, is made public by the Bureau of Aircraft Production. A limited number of voluntary inductions of men registered under the present draft will be allowed. Induction is open only to men in class 1-A who are classified for limited service or who are in the remediable group, and to men placed in deferred classes on account of dependents. The work will not only be of great service to the Government in the production of airplanes, states the Bureau of Aircraft Production, but it will prove beneficial to the individuals because of the training they will receive. Applicants should communicate with the Personnel Officer, Finance Division, Bureau of Aircraft Production, 119 D Street, N. E., Washington, D. C.

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Wisconsin Registration Total $2,049,680

MILWAUKEE, Sept. 2 — Wisconsin motorists paid the sum of $2,049,680 into the coffers of the State of Wisconsin in registration and license fees during the fiscal year ended June 30, 1918, according to the report of the Secretary of State. For the previous period the income was $834,142. The large gain is due both to the doubling of fees in Jan. 1, 1918, and the vast gain in the number of cars registered. Since the beginning of the present year owners pay an annual fee of $10, instead of $5; dealers pay $25, instead of $10, and trucks pay a graduated fee according to weight, ranging from $15 to $25, instead of the flat fee of $5 formerly in effect.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

To Produce New Milling Machine

MILWAUKEE, Sept. 2—Frank M. Davis, formerly president and general manager, and John T. Thompson, formerly vice-president and works manager of the Davis Mfg. Co., Milwaukee, now the gas engine division of the Avery company, Peoria, Ill., have perfected a new type of milling machine in the manufacture of which they will engage at once. Experimental work has been completed and arrangements made for quantity production under contract with the Smith Engineering Works, Milwaukee, until it is found practicable to build and equip a new plant in West Allis, on a site already acquired. The machine will be known as the Davis-Thompson continuous miller. The principal feature of this design, which is entirely new, is that it has two sets of milling cutters and a round table, enabling one machine to do both the rough and finish cutting without removing the work from the table. It is claimed the machine does the work of six ordinary millers. Patents have been granted to Davis and Thompson, who will conduct the business under the name of Davis-Thompson Co.

Madison Motors Merges With Bull Tractor

INDIANAPOLIS, Aug. 31—The Madison Motors Corp., which was formed in 1915, has merged with the Bull Tractor Co., Minneapolis. The capital is $1,500,000 preferred and $1,200,000 common stock. Cecil Gibson, formerly president and general manager of the Madison Corp., is president of the new company, L. A. Brown is treasurer and John F. Green and Frederick N. Judson, formerly controllers of the Bull Co., are on the board of directors. Mr. Green has just succeeded ex-President Taft on the War Labor Board. The factory of the new company is located at Anderson, Ind. Homer McKee will handle the advertising.

Reed Foundry on 75 Per Cent War Basis

KALAMAZOO, Aug. 28—The Reed Foundry & Machine Co., which manufactures the "One Man" tractor, is making steel castings for different branches of the war department, for tanks, ships, hydraulic parts used for piercing shells, iron working lathes to be used in machining and finishing shells. Castings for ditching and dredging machinery are made, and these are sent abroad for trench work. Castings are also made for winches and cranes used in powder plants. Over 75 per cent of the Reed company's foundry work is for Government account.

Automobile Men in Go-Cart Co.

STURGIS, MICH., Aug. 31—Several prominent Detroit manufacturers and business men have interested themselves in the newly reorganized Sturgis Steel Go-Cart Co., among whom is Norval A. Hawkins, general sales manager of the Ford Motor Co., who is the directing spirit of the new enterprise. The company will continue to make the product for which it was designed with certain allied lines which may be taken on later. The new company will be composed of the following officers and directors: President, Charles B. Tuttle, president of the Tuttle & Clark Co., automobile accessories dealer; vice-president, F. L. Burdick of Sturgis, associated with the go-cart company since its inception; secretary and treasurer, D. L. Seymour of Detroit, stocks and bonds. In addition to the officers the directorate is composed of Norval A. Hawkins and John R. Bodde, vice-president of the Peoples' State Bank, Detroit. Among the stockholders is A. L. McMeans, secretary of Dodge Brothers, Detroit.

Aluminum Castings Expands for War Work

CLEVELAND, Aug. 29—For the purpose of expediting war work the Aluminum Castings Co. is greatly enlarging its plant. Work is just being completed on one building, 120 by 260, and two more buildings will be constructed on the adjoining land. One of these buildings, which will be used as a core room, is 140 by 260, and costing $100,000. The company is also erecting sand bins, 32 ft. high, in a building 150 by 460, at a cost of $150,000. When the two buildings are completed the Aluminum Castings Co. will have six buildings in a group.

National Tractor Gets New Plant

CEDAR RAPIDS, Aug. 31—The National Tractor Co. has just finished a large reinforced concrete, brick and steel addition more than doubling the capacity of the plant. This company is building tractors under the Denning patents. The Chicago offices of the company were recently moved to Cedar Rapids, and an Eastern and export sales office has been opened at 151 Fifth Avenue, New York.

Victor Screw Works Increases Capital

The Victor Screw Works, Detroit, has increased its capital stock from $250,000 to $500,000.

Dividends Declared

At a recent meeting of the directors of the Sewell Cushion Wheel Co., Detroit, a 7 per cent cash dividend was declared on both common and preferred stock, which was paid in July to stockholders of record June 15.

The Jordan Motor Car Co., Cleveland, on Aug. 1 paid an 8.6 per cent dividend to stockholders of the original preferred.

Stegeman Becomes Parker Motor Truck

MILWAUKEE, Aug. 31—The Stegeman Motor Car Co., which produces the Stegeman truck, has changed its name to Parker Motor Truck Co. The company states: "The name was changed only after careful consideration. The founder of the company has practically no connection with the present organization at all. It was a name of German origin and we believe that as our soldiers return and tell us of what Germany has stood for the prejudice against everything of German origin will be many times greater than it is now."

Limousine Top Seeking War Work

KALAMAZOO, Aug. 29—The Limousine Top Co., which manufactures demountable limousine tops, closed bodies and truck cabs and bodies, is seeking to turn its factory over to government production and is bidding on eight or ten items, such as mess tables, packing cases, ambulance bodies, field hospital equipment, etc. The company recently built a three-story addition to its plant, covering a plot 164 by 66.

Lane 50 Per Cent on Government Work

KALAMAZOO, MICH., Aug. 31—The Lane Motor Truck Co. is making fifty complete trucks a month for the Government, and the output will be increased to 100 per month within 60 days. The company expects within that time to be devoting itself 75 per cent to Government work. The trucks are of 1½ tons, 2 tons and 3½ tons capacity.

More Room for Falls

MILWAUKEE, WIS., Sept. 2—The Falls Motors Corp., Sheboygan Falls, Wis., has broken ground for another factory addition, 60 x 176 ft., of brick and steel, to provide the additional facilities required to handle its Government contracts for vehicle and aircraft engines.

Galesburg Plant For Dependable

GALESBURG, ILL., Aug. 31—The plans have been approved for the factory of the Dependable Truck & Tractor Co. The structure is to be 100 ft. in width and 300 in depth and will be completed about Dec. 1. In the meantime, trucks will be manufactured in the temporary quarters secured here.

Fire Visits Inner Shoe

GRAND RAPIDS, MICH., Aug. 31—The plant of the Inner Shoe & Tire Co. was destroyed by fire, the damage being estimated at $30,000, of which $7,000 is on the building and $23,000 on the contents. A new factory will be erected on the same site.

Capital Increases

The Van Dorn Electric Tool Co., Cleveland, has taken out a permit for a two-story machineshop addition, 37 by 31.

The Dayton Castings Co., Dayton, Ohio, has increased its capital stock from $15,000 to $50,000.

Men of the Industry

Changes in Personnel and Position

Owston Made Major

C. W. Owston, formerly purchasing agent of the McCord Mfg. Co., Detroit, has been promoted from captain in the Ordnance Officers' Reserve Corps to major.

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George R. Cullen has been added to the staff of the Bearley-Hamilton Co., advertising agent, Grand Rapids, Mich. He was formerly publicity manager of the Hudson Motor Car Co. and editor of the Triangle and the Hudson Super-Six News-Pictorial.

—

Glenn A. Sanford, who has been associated with the Jackson Steel Products Co., Jackson, Mich., for some time, has been appointed sales manager of the rim division of that company.

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Dwight Davis, for some years assistant to the general manager of the Hyatt Roller Bearing Co., Newark, N. J., assumed the position of assistant to the general manager of the Ever Tight Piston Ring Co., St. Louis, on Sept. 1.

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T. P. C. Forbes, for some time a partner of John N. Willys, has been appointed assistant sales manager of the Fulton Motor Truck Co. For the past ten months Mr. Forbes has been general traveling representative with the Fulton Co.

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V. Hughes has resigned from the Overland Motor Co. to enter Government service as aeronautical engineer, Aviation Section, Signal Corps, and is assigned to McCook Field, Dayton, Ohio.

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W. G. Bell has been appointed Canadian sales manager of the Cleveland Tractor Co., Cleveland. For the past four years he has been assistant sales manager in the Dominion of Canada for the Studebaker Corp.

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Thomas A. DeVilbiss, president of the Toledo War Industries Commission, has been appointed sub-regional chairman for the Toledo district.

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H. B. Garman has been appointed plant manager of the Detroit plant of the Steel Products Co. He has been associated with the company for a number of years as superintendent of the Detroit factory.

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George A. Robson, for 3 years office manager and first assistant to the officials and advertising manager of the Chalmers Motor Co., has resigned. He has formed no other connection, but expects to do so shortly.

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Clem Jackson has been promoted from the position of assistant chief engineer to chief engineer of the Erd Motor Co., Saginaw. He was formerly with the Mitchell Motor Co., Racine, and at one time was assistant chief engineer of the Haynes Automobile Co., Kokomo.

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E. C. Newcombe has been made a director of the Four-Drive Tractor Co., Big Rapids, Mich., and also vice-president. Two resignations from the directorate are those of George A. Wright and Harley Frederick, the latter of whom is expected to remain as manager.

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C. B. Meyers has been appointed manager of the sales promotion department of the United States Motor Truck Co., Covington, Ky.

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L. F. Miller, formerly of the Mitchell Motors Co., Racine, Wis., has accepted a position with the Anderson Forge & Machine Co., Detroit, as metallurgist.

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Franklin Prices Increased $450-$600

SYRACUSE, Aug. 31—The Franklin Automobile Co. has increased the prices of its cars from $450 to $600, effective at once. The new prices follow:

Model	New Price	Old Price
4 and 5 pass. tour	$2,900	$2,450
2 pass roadster	2,850	2,450
Sedan	3,350	2,950
Brougham	3,900	3,300
Town car	4,050	3,450
Limousine	4,050	3,450

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Congress of National Safety Council to Deal With Accident Prevention

CHICAGO, Aug. 31—The seventh annual congress of the National Safety Council, which will convene at the Hotel Statler, St. Louis, from Sept. 16 to 20, will be devoted to all aspects of accident prevention and allied topics in relation to war conditions. A message emphasizing the pressing need for conserving man power will be received from President Wilson, the Hon. Franklin K. Lane will deliver an address on "Safety as an Asset in Winning the War," and Charles M. Schwab, director of the Emergency Fleet Corporation, will speak on "The Democratization of Industry." Other addresses on allied subjects of importance will be given by men of recognized authority.

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Representatives of Parts Manufacturers Co-operate With Dauch

SANDUSKY, OHIO, Aug. 31—The Dauch Manufacturing Co., builder of the Sandusky tractor, has arranged with the various companies manufacturing standard parts used in the construction of the tractor to co-operate to the limit of their various capacities in speeding up production and insuring a more efficient tractor. Accordingly, one executive from each company has been selected to become a member of the Dauch executive board, where he will give the company the benefit of his specialized experience, and thus help in the development of co-operative manufacture.

Kettering to Address Detroit Section

DETROIT, Aug. 31—C. F. Kettering, president of the Dayton Engineering Laboratories Co. and president of the Society of Automotive Engineers, will address the Detroit Section on the subject of the future of the airplane industry after the war. The meeting will be held on Sept. 20 at the Hotel Pontchartrain, Detroit, at 8 p. m. It is expected that a number of out-of-town people from the airplane industry will be present to hear Mr. Kettering's address.

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Tractor Rally for Milwaukee

MILWAUKEE, Sept. 4—Final plans for a state-wide tractor rally to be held in Milwaukee during State Fair week, Sept. 9 to 14, were made by the Wisconsin Power Farming Association at a meeting on Tuesday evening, Sept. 3. The association met on Aug. 27 to discuss plans and postponed action for one week in anticipation of a full attendance of members, each of whom is a sales manager, branch manager or distributer of farm tractors in Wisconsin.

The purpose of the rally will be to bring to Milwaukee all dealers and owners of tractors so that they may be informed concerning the service plan being evolved by the association.

—

Machine Shop Men Organize for War Work

DETROIT, Aug. 31—Another step in the organization in the individual industries of District No. 1 of the Michigan war resources committee of the War Industries Board was taken recently, when the machine shop owners of Wayne, Oakland and Monroe counties met in the Detroit Board of Commerce. The purpose of the meeting was to organize machine shop men so that a survey of their facilities can be made. Similar meetings of the stamping and forging and casting manufacturers have been held and it is planned by the district head to organize all individual industries in the same manner with a sub-chairman in charge of each.

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Some Statistics from Ford

DETROIT, Aug. 31—Slightly more than 3000 workers from the Ford Motor Co. plant have been transferred to the Ford shipbuilding plant to work on the Eagles within the last 3 months. Between 15 and 30 young men are leaving the plant daily to take their places in the ranks of the navy or the army. Very nearly 6000 have left the factory for national service during the past year.

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Oil Storage in France

WASHINGTON, Aug. 31—Four oil tanks of 55,000-barrel capacity each have been secured by the Quartermaster Corps for shipment to France, where they will be erected for the use of the American Expeditionary Forces. These tanks will give storage for 11,000,000 gal. of oil or gasoline, approximately the requirements for a 2-month period.

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Pig Iron Production Falls—Washington Conference

As was expected, August pig-iron production fell below that of July. It was at a less rate also than the outputs of April, May and June, but was higher than that of any other month since May, 1917. The total was 3,389,585 gross tons, or 109,341 tons a day, against 3,420,988 tons in July, or 110,354 tons a day—a falling off in the daily rate of about 1000 tons.

The meeting of iron and steel manufacturers in New York on Aug. 28 was occupied solely with the labor question and the matter of possible price changes for the last quarter of the year was not touched. Leaders in the industry realize that even the present insufficient rate of production cannot be maintained unless special measures are taken in connection with the new draft. More important still is the maintenance of existing hours and the safeguarding of the industry for the period of the war against such restrictions of output as have commonly accompanied union control. Some of the recent Washington decisions of labor issues have evidently not taken into account the grave consequences to the war program which would result from a wide enforcement of such findings in the steel and metal-working trades.

The conference on iron and steel prices between the general steel committee and the War Industries Board is appointed for Sept. 18 at Washington. An all-day meeting of the committee in New York, Sept. 3, will be followed by others at which the requests of various groups of manufacturers for higher prices will be considered.

Representatives of the malleable castings industry at a meeting in New York Aug. 30 adopted prices, making a number of revisions in the existing schedule, and these will be recommended to the War Industries Board.

The threatened inventory of the country's stocks of finished steel has been ordered by the War Industries Board. Manufacturing consumers of rolled iron and steel must report what they have down to the smallest holdings. Commandeering of surplus stocks for war purposes is a probable next step.—*Iron Age.*

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Edge May Re-enter British Trade

LONDON, ENGLAND, Aug. 20—S. F. Edge, who was one of the pioneer automobile dealers in England, and who had the sole selling rights of the Napier, will, in all probability re-enter the automobile field. When he sold the Napier for $1,000,000 one of the conditions was that he should not engage in the automobile industry directly or indirectly for a period of 10 years. That period will soon expire and it is expected that Mr. Edge and several other manufacturers will develop a line of low-priced automobiles. Nothing is definitely announced yet as to the type of car that will be built.

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California Oil Production Decreases

SAN FRANCISCO, Sept. 5—The production of crude oil in California fields decreased 1037 barrels a day during July as compared with June. During July the total production was 87,737,629 barrels, which averages 281,859 barrels a day. There were 54 wells completed in July with an initial output of 12,022 barrels daily, compared with 46 wells finished in June with an initial daily output of 5492 barrels. Stocks of crude on hand Aug. 1 were about 200,000 barrels in excess of the quantity on hand July 1.

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England Has 3780 Fordsons

LONDON, ENG., Aug. 13—According to a report made in the House of Commons last week there are 3780 Fordson tractors at the disposal of the Food Production Department. There are also 1700 heavier tractors of the following types at the disposal of government departments as follows: Titan, Mogul, Saunderson, Overtime and Clayton. In all some 3780 Fordson tractors are proposed to be used for the department's own tractor scheme, as a large number, if not the majority of these tractors, have been transferred to Henry Ford & Sons for distribution through regular trade channels.

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To Curb Rent Profiteering

WASHINGTON, Sept. 4—To curb rent profiteering in war manufacturing localities the Department of Labor has introduced a bill in Congress, allowing the President to requisition houses and apartments where the rent is excessive for the duration of the war. In event the landlord is not satisfied with the compensation set by the Government, he is entitled under the terms of the bill to sue the Government.

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1200 Military Tractors a Month

WASHINGTON, Sept. 4—Production of military tractors is now averaging 1200 per month, according to a statement made here this week by the Acting Secretary of War. He stated further that this production is "not nearly what it should be."

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Shuler Axle Expanding for War Work

DETROIT, Aug. 31—The Shuler Axle Mfg. Co. has increased its capital stock from $150,000 to $200,000 to allow for further expansion of its plant to meet government requirements. The company is already on a 95 per cent war basis, indirectly, furnishing axles to manufacturers who have received government orders.

Bituminous Production Better—A Car Shortage

During the week ended Aug. 24 the production of bituminous coal showed the first improvement in five weeks, due to a slight betterment in the car supply. The output for that week totaled 12,603,000 net tons, and would have been much greater if the car allotment had been regular and the loaded cars had been speeded away from the mines. In fact, the erratic car supply during the month of August was at once the despair of the Federal Fuel Administration—which sees the demand for coal growing larger and larger—and a stumbling block to the operator—who wishes to keep his laboring forces intact and instead finds his men leaving for industries that promise more steady employment.

Anthracite production is not only keeping up, but shows an increase in output for the week ended Aug. 24 with the shipment from the mines of 2,134,000 net tons. The total production of anthracite for the coal year to date is estimated at 41,768,000 net tons, an increase over 1917 of 869,000 net tons.

The Lake trade is active. Under governmental stimulus a larger tonnage is being moved from Ohio and West Virginia to the lower lake ports. Shipments are still behind pre-season estimates, however, and in order to enable the Pittsburgh region to meet its quota coal is being withheld from all nonessential industries in that district, while plants on the preference list which had been receiving only 50 per cent of their requirements are to be still further reduced. There is strong basis for the feeling that the Northwest will be supplied before the close of navigation.—*Coal Age.*

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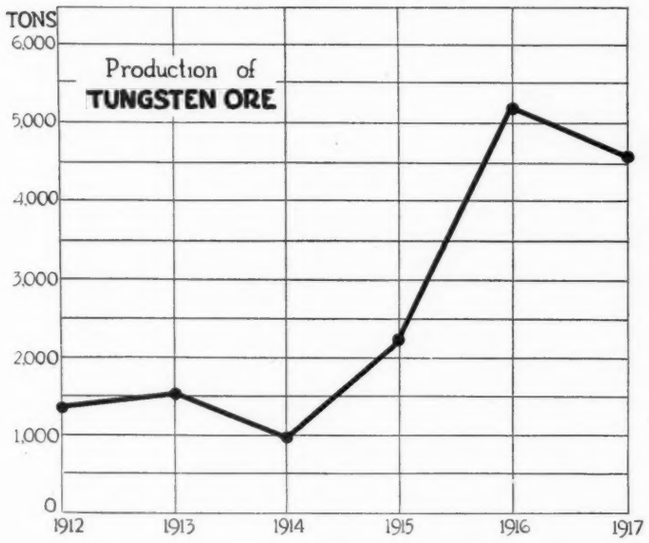
Reorganization of Motor Transport Corps

WASHINGTON, Sept. 4—The article telling of the organization of the Motor Transport Corps in AUTOMOTIVE INDUSTRIES of Aug. 22 was not the official Government statement. The official publicity telling of the organization of this Corps was not given out until one week following the publication of this fact in AUTOMOTIVE INDUSTRIES. The article published in AUTOMOTIVE INDUSTRIES comprised opinions and information gathered here combined with the history of past military truck activities known publicly prior to this reorganization, and which had been told previously in these columns. Copy of the order organizing the Motor Transport Corps which was reproduced was secured from the office of the Adjutant General. These statements are made at the request of War Department officials who are desirous of having the public understand that the article was not the official one.

AUTOMOTIVE MATERIALS MARKETS

Materials Market Prices

Acids:
Muriatic, lb. ..... .02-.03
Phosphoric, ct. ... .35-.39
Sulphuric (60), lb. .009
Aluminum:
Ingot, lb. ..... .33
Sheets (18 gage or more), lb. ..... .40
Antimony, lb. ..... .13⅞-.14⅛
Burlap:
8 oz., yd..... .18
10 oz., yd..... .23
Copper:
Elec., lb. ..... .26
Lake, lb. ..... .26
Fabric, Tire (17¼ oz.):
Sea Is., combed, lb.1.65-1.70
Egypt, combed, lb.1.25-1.35
Egypt, carded, lb..1.20-1.30
Peelers, combed, lb.1.05-1.20
Peelers, carded, lb. .95-1.05
Fibre (⅛ in. sheet base), lb. ..... .50
Graphite:
Ceylon, lb. ..... .07½-.25
Madagascar, lb. .. .10 -.15
Mexican, lb. ..... .03¾
Lead, lb. ..... .08-.09
Leather:
Hides, lb. ..... .18-.35¼
Nickel, lb. ..... .40-.43
Oil:
Gasoline:
Auto., gal. ..... .24½
68 to 70 gal..... .30½
Lard:
Prime City, gal..2.30
Ex. No. 1, gal....1.60
Linseed, gal. 1.90
Menhaden (Brown) gal. 1.30-1.31
Petroleum (crude), Kansas, bbl. 2.25
Pennsylvania, bbl. 4.00
Rubber:
Ceylon:
First latex pale crepe, lb. ..... .63
Brown, crepe, thin, clear, lb. ..... .60
Smoked, ribbed sheets, lb. ..... .62
Para:
Up River, fine, lb. .68
Up River, coarse, lb. ..... .40
Island, fine, lb... .59
Island, coarse, lb. .27
Shellac (orange), gal. .70-.76
Spelter ..... .09⅜-.09⅝
Steel:
Angle beams and channels, lb. .... .03
Automobile sheet (see sp. table).
Cold rolled, lb..... .06½
Hot rolled, lb..... .03½
Tin ..... .80-.81
Tungsten, lb. 2.40
Waste (cotton), lb... .12¾-.17



The effect of the war is shown in the largely increased production of Tungsten ore since 1914. *Last year showed a slight falling off compared to* 1916, *but nevertheless the value of the* 1917 *production was* $5,100,000

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock	$5.95	$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat fender, door and apron, or splash guard stock	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45

Automobile Sheet Extras for Extreme Widths:
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.

Black Sheet Extras to Apply to Narrow Widths:
Oiling, 10c. per 100 lb.
Patent leveling, 25c. per 100 lb.
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.

Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.

Automotive Securities Quotations on the New York Exchange

	Bid	Asked	Net Ch'ge
Ajax Rubber Co.	62	64	..
J. I. Case T. M. Co., pfd.	78	83½	—2
Chalmers Motor Co., com.	4½	5½	..
Chalmers Motor Co., pfd.	20	30	..
Chandler Motor Car Co.	86	88	—1½
Chevrolet Motor Co.	127	130	—12
Fisher Body Corp., com.	35	37	—1
Fisher Body Corp, pfd.	85	..	—4
Fisk Rubber Co., com.	60	62	..
Fisk Rubber Co., 1st pfd.	98	103	..
Fisk Rubber Co., 2nd pfd.	78	83	..
Firestone Tire & Rubber Co., com.	105	107	+1
Firestone Tire & Rubber Co., pfd.	94	96	..
General Motors Co., com.	132	137	—30
General Motors Co., pfd.	78⅛	80	—3½
B. F. Goodrich Co., com.	44¼	45¾	+ ¼
B. F. Goodrich Co., pfd.	99	100⅛	+ ½
Goodyear Tire & Rubber Co., com.	150	155	..
Goodyear Tire & Rubber Co., pfd.	97½	98½	..
Grant Motor Car Corp.	2¼	3	..
Hupp Motor Car Corp, com.	2⅜	3⅛	..
Hupp Motor Car Corp., pfd.	78	82	..
International Motor Cor., com.	28	32	+1
International Motor Co., 2nd pfd.	35	40	—1
International Motor Co., 2nd pfd.	35	40	—1
Kelly-Springfield Tire Co., com.	47½	48	— ½
Kelly-Springfield Tire Co., 1st pfd.	81	87	+1
Lee Rubber & Tire Corp.	19¾	20¼	+ ¼
Maxwell Motor Co., Inc., com.	26¾	27¼	+ ¾
Maxwell Motor Co., Inc., 1st pfd.	56¾	57½	+ ¼
Maxwell Motor Co., Inc., 2nd pfd.	20	21	— ¼
Miller Rubber Co., com.	106	108	+1
Miller Rubber Co., pfd.	95	96	..
Packard Motor Car Co., com.	..	120	..
Packard Motor Car Co., pfd.	94	97	..
Paige-Detroit Motor Car Co.	17	18	..
Peerless Truck & Motor Corp.	15	17	..
Portage Rubber Co.	105	109	+1
Reo Motor Car Co.	14½	15½	..
*Saxon Motor Car Corp.	6	7	+ ⅜
Standard Motor Construction Co.	12¼	13	— ¼
Standard Parts	59	61	—1¼
*Stewart-Warner Speed. Corp.	56	57	— ½
*Studebaker Corp., com.	43	44	— ½
*Studebaker Corp., pfd.	84	90	+2½
Swinehart Tire & Rubber Co.	50	60	+5
United Motors Corp.	32½	33	— ¼
*U. S. Rubber Co., com.	62¼	63¼	..
*U. S. Rubber Co., pfd.	103½	104½	— ½
*White Motor Co.	45⅞	46⅝	+ ⅛
*Willys-Overland Co., com.	19⅛	19¼	— ½

*At close Aug. 3. Listed N. Y. Stock Exchange.

Aircraft Production Purchases

WASHINGTON, Aug. 31—Following is a list of contracts placed by the Bureau of Aircraft Production recently:

Wright-Martin Aircraft Corp., New Brunswick, N. J., spares for 150-horsepower type A Hispano-Suiza engine.

Curtiss Aeroplane & Motor Corp., Buffalo, hexagon-head bolts with castellated nuts.

Cherry Lumber Co., Cincinnati, 60,000 ft. walnut lumber.

Brown & Harris Lumber Co., Holmesville, Ohio, 50,000 ft. walnut lumber.

West Virginia Aircraft Corp., Wheeling, spares for 500 JN4D training planes: Engine-bed bearers, elevators, rudders, wings, landing gears, etc.

John A. Roebling's Sons Co., Trenton, 240,000 ft. balloon cable.

Pyrene Co., care of H. B. Vandergrift, Continental Hotel, Washington, D. C., 5000 Pyrene fire extinguishers.

Liberty Iron Works, Sacramento, spares for 100 JN4D planes: Elevators, vertical fins, landing gears, rudders, wings, etc.

International Register Co., Chicago, 3500 mechanical interrupter gears.

Dayton-Wright Airplane Co., Dayton, spares for D.H.4 planes: wings, stabilizer braces, front direct-wire fitting with tie rods.

Dayton-Wright Airplane Co., Dayton, parts for D.H.4 planes: wings, right and left ailerons, elevators, rudder, landing gears, etc.

Wright-Martin Aircraft Corp., New Brunswick, spares for Hispano-Suiza motors: Speedometer shaft and bushing assembly, cotter pins, air pump parts, gaskets, nuts, etc.

N. C. L. Engineering Corp., Providence, 50 N. C. L. windlasses, complete.

James Cunningham Son & Co., Rochester, 25 Cacquot windlasses.

McKeen Motor Car Co., Omaha, Neb., 25 Burton windlasses.

Cleveland Tractor Co., Cleveland, 10 standard model H Cleveland tractors.

Livingston Radiator & Mfg. Co., New York, 541 Handley-Page type radiators.

Whittaker-Glessner Co., Portsmouth, Ohio, 700 steel drums, 110-gallon capacity.

Chase Metal Works, Waterbury, Conn., seamless copper tubing.

Sheffield By-Products Co., New York, N. Y., 40,000 pounds casein.

N. C. L. Engineering Corps, New York, N. Y., 1 N. C. L. kite balloon windlass.

Gilbert & Barker Mfg. Co., Springfield, 10 tanks of 10,200 gallons' capacity each.

Dobbie Foundry & Machine Co., Niagara Falls, 100 No. 21 single-drum hand-power hoists.

Henry Cheney Hammer Corp., Little Falls, N. Y., 14,400 hammers.

Henry Cheney Hammer Corp., Little Falls, 13,150 hammers.

Collieries Supply & Equipment Co., Philadelphia, 48 electrical engineers' chests.

Blaw-Knox Co., Pittsburgh, furnishing and fabricating necessary structural steel and accessory structural material for the construction of 70 hangars.

Belmont Iron Works, Philadelphia, furnishing and fabricating 576 columns (approximately 1500 pounds each).

Whittaker-Glessner Co., Portsmouth, Ohio, 1000 steel drums, 110 gallons' capacity.

Contracts

Ayer & McKinney, Philadelphia, 30,000 pounds casein.

Standard Aero Corp. of New York, Elizabeth, 30 E-1 advanced planes constructed to mount Gnome motors.

Standard Aero Corp. of New York, Elizabeth, 6 E-1 advanced planes constructed to take LeRhone motors.

Fedders Mfg. Co. (Inc.), Buffalo, 109 radiators complete, with inlet and outlet connections.

Hartzell Walnut Propeller Co., Piqua, 1000 wooden air fans.

Hardman, Peck & Co., New York, N. Y., 500 sets of laminations for Handley-Page propellers.

Parsons Pulp & Lumber Co., Philadelphia, 4,800,000 ft. spruce.

Light Mfg. & Foundry Co., Pittstown, spares for OX5 engine, upper and lower crankcase bearing caps.

Lamb, Finlay & Co., New York City, for services in connection with the handling, paying of duties, and shipping of airplane linens, tapes and balloon cloths, which are being imported from Great Britain for the Bureau of Aircraft Production.

Louisiana Oxygen Co., New Orleans, 500,000 cubic ft. hydrogen gas.

Isaac McLean Sons Co., Dorchester, Boston, 10,000 ft. African mahogany and 25,000 ft. Mexican or Central American mahogany.

Ericsson Mfg. Co., Buffalo, parts for Berling, type D81 magneto (99 items).

Link Tool & Machine Corp., New York, miscellaneous thread gages to be furnished from time to time.

Paul Whitin Mfg. Co., Northbridge, Mass., 25,000 yards cotton airplane fabric.

Wright-Martin Aircraft Corp., New Brunswick, spares for type 3 engine (43 items).

Wright-Martin Aircraft Corp., New Brunswick, spares for type 3 engine (43 items).

Universal Grinding Machine Co., Pittsburgh, 1 No. 2 grinder with C equipment.

Stewart-Hartshorn Co., New York, N. Y., 2000 sets complete streamline tie rods for D.H.4 machines.

Witherow Steel Co., Pittsburgh, 2000 sets complete streamline tie rods for D.H.4 machines.

Eastman Kodak Co., Rochester, 5000 United States Army unit sights.

J. V. Stimson & Co., Owensboro, Ky., 50,000 ft. walnut lumber.

Hoosier Veneer Co., Indianapolis, 500,000 ft. walnut lumber.

Canadian Aeroplane (Ltd.), Toronto, Canada, 12 wings for JN4D Canadian planes.

Disco Mfg. Co., Detroit, 3000 C. C. gun synchronizing generators.

Wireless Improvement Co., New York City, 1,500 S. C. R., 65 sets.

Arthur F. Smith Co., New York, N. Y., labor and material required to change 315 sets of curtains.

Electro Metallurgical Sales Corp., New York City, 1000 tons ferro-silicon.

Electro Metallurgical Sales Corp., New York City, 200 tons ferro-silicon.

Novo Engine Co., Lansing, air compressor outfits.

Wright-Martin Aircraft Corp., New Brunswick, crankcase.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

Positipe Co., Cleveland, paper film.

American Optical Co., Southbridge, Mass., 10,000 negative lenses.

Gleason Works, Rochester, generators.

Canadian Aeroplanes (Ltd.), Toronto, spares for JN4D planes.

English & Mersick Co., New Haven, radiators.

Dayton-Wright Airplane Co., Dayton, stabilizer braces.

Dayton-Wright Airplane Co., Dayton, stabilizer braces.

Dayton-Wright Airplane Co., Dayton, connections for gasoline rubber joints.

Dayton-Wright Airplane Co., Dayton, control cables.

Dayton-Wright Airplane Co., Dayton, control cables.

Dayton-Wright Airplane Co., Dayton, control cables.

Dayton-Wright Airplane Co., Dayton, stabilizer braces.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

Wright-Martin Aircraft Corp., New Brunswick, engine spares.

American Steel & Wire Co., 30 Church Street, New York, wire.

Columbia Steel & Shafting Co., 1145-1146 Munsey Building, Washington, D. C., cold-rolled steel.

Western Block Co., Lockport, N. Y., tackle blocks.

Curtiss Aeroplane & Motor Corp., Buffalo, spares for planes.

John A. Roebling's Sons Co., Trenton, N. J., cable.

Buffalo Aeroplane Corp., Buffalo, propellers.

Springfield Aircraft Corp., Springfield, Mass., spares for planes.

Willys-Overland Co., Toledo, Ohio, engines.

Splitdorf Electrical Co., 98 Warren Street, Newark, magneto parts.

Union Switch & Signal Co., Swissvale, Pa., engines.

Winton Motor Car Co., Cleveland, engines and spares.

Union Switch & Signal Co., Swissvale, Pa., engines.

Eastman Kodak Co., Rochester, cameras.

Aero Supplies Co., 864 East Thirty-ninth Street, Brooklyn, N. Y., goggles.

Dayton-Wright Airplane Co., Dayton, Ohio, spares for planes.

Wright-Martin Aircraft Corp., New Brunswick, N. J., engine spares.

C. L. Willey Co., 2558 South Robey Street, Chicago, Ill., lumber.

Firestone Tire & Rubber Co., 312 Colorado Building, Washington, D. C., balloons.

Thomas Morse Aircraft Corp., Ithaca, spares for planes.

Walden-Worcester (Inc.), Worcester, parts for planes.

Walden-Worcester (Inc.), Worcester, parts for planes.

Lionel Mfg. Co., 48 East Twenty-first Street, New York City, flame-proof keys.

Connecticut Aircraft Co., New Haven, Conn., balloons.

Bosch Magneto Co., 223-225 West Forty-fifth Street, New York City, magnetos and switches.

Calendar

ENGINEERING

Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

ASSOCIATIONS

Oct. 7-12—Milwaukee. American Foundrymen's Assn. and 5 allied organizations. Milwaukee Auditorium.

SHOWS

Sept. 2-6 — Hartford, Conn. Tractor demonstration (State Fair). Will F. Landon, Secy.

Sept. 2-7—Indianapolis, Indiana, State Fair. Indianapolis Automobile Trade Assn.

Sept. 5—Medina, Orleans Co. Tractor demonstration (State Fair) Food Commission. Calvin J. Huson, Director.

Sept. 8-20—Greely, Weld Co., Colo. Tractor Show, Central Community Fair.

Sept. 9-14—Milwaukee. Milwaukee Automobile Dealers, Inc. Fourth Annual Wisconsin State Fair. Hart J. Ruddle, Mgr.

Sept. 9-14 — Syracuse, N. Y. Tractor demonstration (State Fair). J. Lan Ackerman, Secy.

Sept. 9-15—Madison, Wis. Tractor demonstration (State Fair). O. E. Remy, State Fair Secretary.

Sept. 12-13—Marion, O. Tractor demonstrations, Farm Bureau Associations. M. C. Thomas, County Agricultural Agent.

Sept. 14-21—Chicago, Automotive and Accessories War Exposition. Municipal Pier.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Sept. 17-20—Riverhead, L. I. Tractor demonstration (County Fair). Harry Lee, Secy.

Sept. 30-Oct. 4—Trenton, N. J. Tractor demonstration (Trenton Fair). Harry B. Salter, Supt.

Oct. 16-18—Ottawa, Ont., International Plowing Match, Tractor and Farm Machinery Demonstration. Experimental Farm.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

RACING

Sept. 7 — Chicago. Chicago Speedway.

Sept. 21—Sheepshead Bay.

Oct. 5 — Cincinnati. Cincinnati Speedway.